

ACKNOWLEDGEMENTS

*Accomplishment of this thesis is the result of benovelence of **God**, blessings of my parents, brothers, sister-in-law and love of my beloved Chinu.*

*I express my profound sense of gratitude and respect to my Major Advisor **Dr. P.V.Rama Kumar**, Associate Professor, Department of Genetics and Plant Breeding, Agricultural College, Bapatla for suggesting the problem, intellectual and inspiring guidance, constructive criticism and constant encouragement throughout the period of this investigation and in the preparation of the manuscript.*

*At the very outset I whole heartedly express my profound sense of gratitude to the esteemed **Dr. C. Panduranga Rao**, Professor and Head,, Department of Genetics and Plant Breeding, Agricultural College, Bapatla for his benign guidance, constant affectionate encouragement and ineffable moral support in this scientific investigation. His boundless patience and untiring efforts during drafting of this thesis were of inestimable value. I acknowledge all his contributions more gratefully.*

*I express my sincere thanks to **Dr. V. Srinivasa Rao**, Assistant Professor, Department of Statistics and Mathematics, Agricultural College, Bapatla for his valuable suggestions in the statistical analysis of the investigation and in presentation of this thesis.*

*I am very much pleased to place my appreciation and gratitude to **Smt.P.L.R.J.Praveena** for her valuable suggestions and whole hearted co-operation.*

*I also express my heartfelt thanks to **Dr.Ch.V.Durga Rani** and **Smt. Razia Sultana** for their guidance and moral support at every stage of the research programme.*

I take this opportunity to thank the Plant Breeder, Agricultural Research Station, Amadalavalasa for providing the seed material required for the present investigation.

*I am highly thankful to **Hanumantha Rao** garu, Head of Agricultural College Farm, Bapatla for affording all the facilities to carryout experiment.*

*I extend my sincere thanks to **Uma Devi**, Librarian and other staff of Library for their help during my course.*

*I am in dearth of words to express unboundful gratitude and affection to my parents, **Sri Ganapathi Rao.Ch** and **Savitri. Ch**, my brothers **Venkata Ramana, Suryam** and **Varaprasad**, my sister-in-law **Anitha** and my heartiest friend **Chinu** who are every thing to me.*

*I am highly indebted to my brother **Viswanath** for his affection.*

*My special thanks to my friends **Chandana, B.V.Padmaja, Anuradha, Vijetha, Padmaja, Ravi Krishna** and my Classmates.*

*I am at loss of words to express my thanks to **Dr. Ravuri Veeraraghavaiah**, for his invaluable support and ever helping nature during my stay in this college.*

*The financial assistance provided by the **Acharya N.G.Ranga Agricultural University** in the form of stipend for prosecuting post-graduate study is gratefully acknowledged.*

*Last but not least, the execution in typing the manuscript of the thesis by **K.S.Rama Krishna, Krishna Computers** is acknowledged with thanks.*

Date:

[CH. RANI]

LIST OF TABLES

Table No.	Title	Page No.
1.	Indirect effects of component characters on fibre yield in roselle hemp (<i>Hibiscus sabdariffa</i> L.)	...
2.	Source of origin and some important traits of the 50 selected genotypes of roselle hemp (<i>Hibiscus sabdariffa</i> L.)	...
3.	Mean performance of 10 characters in 50 genotypes of roselle hemp (<i>Hibiscus sabdariffa</i> L.)	...
4.	Analysis of variance for ten characters in 50 genotypes of roselle hemp (<i>Hibiscus sabdariffa</i> L.)(Mean sum of squares)	...
5.	Variability, heritability and genetic advance for yield and yield components of 50 roselle hemp (<i>Hibiscus sabdariffa</i> L.) genotypes during <i>kharif</i> 2005	...
6.	Genotypic correlation coefficients of yield components in 50 genotypes of roselle hemp (<i>Hibiscus sabdariffa</i> L.)	...
7.	Phenotypic correlation coefficients of yield components in 50 genotypes of roselle hemp (<i>Hibiscus sabdariffa</i> L.)	...
8.	Genotypic path coefficients of yield components in 50 genotypes of roselle hemp (<i>Hibiscus sabdariffa</i> L.)	...
9.	Phenotypic path coefficients of yield components in 50 genotypes of roselle hemp (<i>Hibiscus sabdariffa</i> L.)	...
10.	Economic weights (a_i) for different characters in roselle hemp (<i>Hibiscus sabdariffa</i> L.) genotypes for classical selection indices	...
11.	Weighing coefficients (b_i) for different characters in roselle hemp (<i>Hibiscus sabdariffa</i> L.) genotypes for classical selection indices	...
12.	Selection criterion values for 50 genotypes of roselle hemp (<i>Hibiscus sabdariffa</i> L.) genotypes	...
13.	Weighing coefficients (b_i) in case of restricted selection indices in roselle hemp (<i>Hibiscus sabdariffa</i> L.) genotypes	...
14.	Genetic advance (ΔG_i) values in case of single restricted selection indices in roselle hemp (<i>Hibiscus sabdariffa</i> L.) genotypes	...

LIST OF FIGURES

Fig. No.	Title	Page No.
1.	Genotypic path diagram for fibre yield/plot in roselle hemp (<i>Hibiscus sabdariffa</i> L.)	...
2.	Phenotypic path diagram for fibre yield/plot in roselle hemp (<i>Hibiscus sabdariffa</i> L.)	...

List of Abbreviations and Symbols

a_i	:	economic weight
ANOVA	:	analysis of variance
b_i	:	weighing coefficients
CD	:	critical difference
cm	:	centimeters
CMIE	:	centre for monitoring Indian Economy
CV	:	coefficient of variation
d.f.	:	degrees of freedom
<i>et al.</i>	:	and others
etc	:	et cetera
Fig.	:	figure
g	:	grams
GAM	:	genetic advance as per cent of mean
GCV	:	genotypic coefficient of variation
ΔG_i	:	genetic advance
h^2	:	heritability
K_2O	:	potassium
kg/ha	:	kilogram per hectare
N	:	nitrogen
P_2O_5	:	phosphorus
PCV	:	phenotypic coefficient of variation
r_p	:	phenotypic correlation coefficient
r_g	:	genotypic correlation coefficient
SE	:	standard error
W_i	:	weighing coefficient
%	:	per cent
/	:	per

ABSTRACT

NAME OF THE AUTHOR : **CH. RANI**

TITLE OF THE THESIS : SELECTION INDICES IN ROSELLE
HEMP (*Hibiscus sabdariffa* L.)

DEGREE FOR WHICH THE : MASTER OF SCIENCE IN
THESIS IS SUBMITTED AGRICULTURE

FACULTY : AGRICULTURE

DISCIPLINE : GENETICS AND PLANT BREEDING

MAJOR ADVISOR : **Dr. P.V. RAMA KUMAR**

UNIVERSITY : ACHARYA N.G. RANGA
AGRICULTURAL UNIVERSITY

The present investigation was conducted at Agricultural College Farm, Bapatla during kharif 2005 to study the genetic variability, heritability, genetic advance, correlations, path analysis and selection indices in fifty roselle genotypes for ten characters viz., days to 50% flowering, plant height, number of internodes, internodal length, basal stem diameter, bark thickness, fibre-wood ratio, fibre length, fibre yield per plant and fibre yield per plot.

Analysis of variance revealed that the material used in the present investigation possessed significant differences among the genotypes. Wider genetic variability with high heritability and high genetic advance was observed for all the characters except days to 50% flowering. Days to 50% flowering recorded high heritability with moderate genetic advance.

The correlation studies revealed that fibre yield per plot was significantly and positively associated with plant height, number of internodes, basal stem diameter, bark thickness, fibre length and fibre yield per plant. Hence selection of these characters will be helpful in improving the yield.

The results of path coefficient analysis supported that selection can be practiced for basal stem diameter, bark thickness, fibre length and fibre yield per plant as these characters manifested both positive direct effects and positive correlation with fibre yield per plot.

Studies on genetic advance and relative efficiency of selection indices indicated that days to 50% flowering, plant height, number of internodes, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot together formed efficient selection index and may be useful for simultaneous character improvement in roselle.

CHAPATER – I

INTRODUCTION

Roselle (*Hibiscus sabdariffa* L.) is a self pollinated crop with chromosome number $n=36$, belongs to family Malvaceae. It is a drought resistant crop mainly cultivated for its fibre. In India kenaf and roselle are cultivated in 176.4 thousand hectares with an annual production of about 1090 thousand bales of fibre (1 bale =180 kg) (CMIE¹ 2002). In Andhra Pradesh roselle is cultivated in an area of 53,629 hectares with an out turn of 4,58,390 tonnes (Statistical abstract of Andhra Pradesh 2005). In Andhra Pradesh it is grown mainly in the districts of Visakhapatnam, Vizayanagaram, Srikakulam with an annual fibre production of 6,61,200 bales and the average yield per acre is 5,729 (Vyavasaya panchangam 2005-06).

Mesta is a bast fibre crop, fibre is obtained from the bast i.e., from the phloem region outside the vascular cambium in the stem. The lignified fibre is chiefly used for making cordages, gunny bags, sacking material, fishing nets, floor mats, hessian and carpet backing etc., It can be blended with jute and cotton for producing jute goods and decorative cloth curtains and upholstery respectively. Jute and mesta can help to mitigate the problem of forest depletion, if these are used for papermaking. Mesta fibre can be used for making writing paper and currency notes, manufacturing of news print and craft paper. The fibre is also used for making high quality glazed paper, durable card boards etc.,

CMIE¹ (2002) Centre for Monitoring Indian Economy (Indian harvest database)

By adopting innovative breeding techniques the fibre yield of roselle in different growing regions can be improved.

Breeding for higher yield is the major objective of any crop improvement programme. Yield is a complex character, which is polygenic and highly influenced by environment. A complete understanding of the nature and magnitude of genetic variability for yield components and association of these yield components with yield and among themselves is useful for initiation of a suitable breeding programme.

Direct selection is not effective for quantitatively inherited characters which have low heritability. The extent of association between the yield and the yield components can be established through the correlation coefficients. Path coefficient analysis partitions the observed correlation of the character into direct and indirect effects through other components towards yield.

Construction of selection indices using discriminant function technique will be highly helpful in making selection on several characters simultaneously and to discriminate desirable genotypes from undesirable ones on the basis of their phenotypic performance.

Based on the importance of above aspects the present investigation is carried out with the following objectives.

1. To find out the extent of genetic variation, heritability and genetic advance of the characters.
2. To ascertain the association of yield and yield components at genotypic and phenotypic levels.

3. To assess the magnitude of direct and indirect effects of component characters on yield by path analysis.
4. To study simultaneous improvement of characters by constructing different selection indices (Classical, Restricted) using discriminant function technique.

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
--	---	------------------------------	-----------

Table 1. Indirect effect of component characters on fibre yield in roselle hemp (*Hibiscus sabdariffa* L.)

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
Days to 50% flowering	Number of internodes per plant	Positive	Aruna <i>et al.</i> (1988), Kameswara Rao (1996) and Anuradha and Suriyakumari (2002) in roselle.
	Internodal length	Positive	Aruna <i>et al.</i> (1988), Kameswara Rao (1996), Krishna Veni and Krishna Murthy (2000b) and Pullibai (2005) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Fibre yield per plant	Positive	Aruna <i>et al.</i> (1988), Krishna Veni and Krishna Murthy (2000b), Anuradha and Suriyakumari (2002) and Pullibai (2005) in roselle.
	Plant height	Positive	Krishna Veni and Krishna Murthy (2000b), Anuradha and Suriyakumar (2002) in roselle, Kantilal (1991) and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Fibre – wood ratio	Positive	Pulli bai (2005) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Basal stem diameter	Positive	Krishna Veni and Krishna Murthy (2000b) and Anuradha and Suriyakumari (2002) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Fibre length	Positive	Krishna Veni and Krishna Murthy (2000b) and Anuradha and Suriyakumari (2002) in roselle
	Plant height	Negative	Aruna <i>et al.</i> (1988), Kameswara Rao (1996) and Pullibai (2005) in roselle.

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
Plant height	Basal stem diameter	Negative	Aruna <i>et al.</i> (1988), Kameswara Rao (1996) and Pullibai (2005) in roselle and Kantilal (1991) in kenaf.
	Fibre length	Negative	Aruna <i>et al.</i> (1988) Kameswara Rao (1996) and Pullibai (2005) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Fibre – wood ratio	Negative	Aruna <i>et al.</i> (1988) and Kameswara Rao (1996) in roselle
	No. of internodes per plant	Negative	Pulli bai (2005) in roselle Kantilal (1991) and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Bark thickness	Negative	Pulli bai (2005) in roselle and Kantilal (1991) in kenaf.
	Fibre length	Positive	Kameswara Rao (1996) and Pullibai (2005) in roselle, Kantilal (1991), Adilakshmi (1992) and Appalaswamy <i>et al.</i> (1995) in kenaf, Chaudhury <i>et al.</i> (1981) in tossa jute
	Fibre yield per plant	Positive	Sinha <i>et al.</i> (1986), Aruna <i>et al.</i> (1988), Hemalatha (1990) and Pullibai (2005) in roselle, Adilakshmi (1992) and XU-Qibin(2000) in kenaf and Chaudhury <i>et al.</i> (1981) in tossa jute.
	No. of internodes per plant	Positive	Aruna <i>et al.</i> (1988), Kameswara Rao (1996), Krishna Veni and Krishna Murthy (2000b), Anuradha and Suriyakumri (2002) and Pullibai (2005) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
	Days to 50% flowering	Positive	Aruna <i>et al.</i> (1988), Anuradha and Suriyakumari (2002) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Internodal length	Positive	Aruna <i>et al.</i> (1988) in roselle.
	Basal stem diameter	Positive	Kameswara Rao (1996), Anuradha and Suriyakumari (2002) and Pullibai (2005) in roselle, Kantilal (1991) in kenaf, Ghosh Dastidar (2003) and Roy and Ghosh Dastidar (2004) in tossa jute and Palit <i>et al.</i> (1996) in jute.
	Fibre-wood ratio	Positive	Kameswara Rao (1996) in roselle, Kantilal (1991) and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Bark thickness	Positive	Pulli bai (2005) in roselle and Kantilal (1991) in kenaf.
	Basal stem diameter	Negative	Aruna <i>et al.</i> (1988), Krishna Veni and Krishna Murthy (2000b) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Fibre wood ratio	Negative	Aruna <i>et al.</i> (1988) and Pulli bai (2005) in roselle.
	No. of internodes per plant	Negative	Kantilal (1991) and Adilakshmi (1992) in kenaf.
	Days to 50% flowering	Negative	Krishna Veni and Krishna Murthy (2000b) and Pullibai (2005) in roselle and Kantilal (1991) in kenaf.
	Internodal length	Negative	Pulli bai (2005) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
No.of internodes per plant	Days to 50% flowering	Positive	Aruna <i>et al.</i> (1988) and Kameswara Rao (1996) and Anuradha and Suriyakumari (2002) in roselle and Appalaswamy <i>et al.</i> (1995).
	Internodal length	Positive	Aruna <i>et al.</i> (1988), Kameswara Rao (1996) and Anuradha and Suriyakumari (2002) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Fibre yield per plant	Positive	Aruna <i>et al.</i> (1988) and Kameswara Rao (1996) in roselle and Adilakshmi (1992) in kenaf.
	Plant height	Positive	Krishna Veni and Krishna Murthy (2000b) and Anuradha and Suriyakumari (2002) in roselle and Kantilal (1991) in kenaf.
	Basal stem diameter	Positive	Kameswara Rao (1996), Krishna Veni and Krishna Murthy (2000b), Anuradha and Suriyakumari (2002) in roselle and Kantilal (1991) in kenaf.
	Fibre length	Positive	Kameswara Rao (1996) in roselle and Kantilal (1991), Adilakshmi (1992) and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Fibre-wood ratio	Positive	Kantilal (1991) and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Bark thickness	Positive	Kantilal (1991) in kenaf.
	Basal stem diameter	Negative	Aruna <i>et al.</i> (1988) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
Internodal length	Plant height	Negative	Aruna <i>et al.</i> (1988) and Kameswara Rao (1996) in roselle and Adilakshmi (1992) and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Fibre-wood ratio	Negative	Aruna <i>et al.</i> (1988) and Kameswara Rao (1996) in roselle.
	Days to 50% flowering	Negative	Krishna Veni and Krishna Murthy (2000b) in roselle, Kantilal (1991) and Adilakshmi (1992) in kenaf.
	Internodal length	Negative	Kameswara Rao (1996) in roselle.
	Fibre length	Negative	Krishna Veni and Krishna Murthy (2000b) in roselle.
	Days to 50% flowering	Positive	Aruna <i>et al.</i> (1988) and Kameswara Rao (1996) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.
	No. of internodes per plant	Positive	Aruna <i>et al.</i> (1988) and Kameswara Rao (1996) in roselle.
	Fibre yield per plant	Positive	Aruna <i>et al.</i> (1988) and Kameswara Rao (1996) in roselle and Adilakshmi (1992) in kenaf.
	Basal stem diameter	Positive	Kameswara Rao (1996) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Fibre length	Positive	Kameswara Rao (1996) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Plant height	Positive	Krishna Veni and Krishna Murthy (2000b) in roselle.
	Plant height	Negative	Aruna <i>et al.</i> (1988) in roselle and Adilakshmi (1992) and Appalaswamy <i>et al.</i> (1995) in kenaf.

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
	Basal stem diameter	Negative	Aruna <i>et al.</i> (1988) and Anuradha and Suriyakumari (2002) in roselle.
	Fibre-wood ratio	Negative	Aruna <i>et al.</i> (1988) in roselle, Appalaswamy <i>et al.</i> (1995) in kenaf.
	No. of internodes per plant	Negative	Adilakshmi (1992) and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Days to 50% flowering	Negative	Anuradha and Suriyakumari (2002) in roselle.
Basal stem diameter	Plant height	Positive	Anuradha and Suriyakumari (2002) in roselle, Kantilal (1991) in kenaf, Roy and Ghosh Dastidar (2004) in tossa jute and Palit (1988) in jute.
	Days to 50% flowering	Positive	Anuradha and Suriyakumari (2002) and Pulli bai (2005) in roselle.
	Fibre length	Positive	Kameswara Rao (1996) in roselle and Appalaswamy <i>et al.</i> (1995) and Kantilal (1991) in kenaf.
	Fibre-wood ratio	Positive	Pullibai (2005) in roselle, Kantilal (1991) and Appalaswamy <i>et al.</i> (1995) in kenaf.
	Bark thickness	Positive	Kantilal (1991) in kenaf.
	Fibre yield per plant	Positive	Krishna Veni and Krishna Murthy (2000b) and Pulli bai (2005) in roselle, Adilakshmi (1992) and XU-Qibin (2000) in kenaf.

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
	No. of internodes per plant	Positive	Kameswara Rao (1996) ,Krishna Veni and Krishna Murthy (2000b) in roselle and Anuradha and Suriyakumari (2002) in roselle and Appalaswamy <i>et al.</i> (1995) in kenaf
	Internodal length	Positive	Kameswara Rao (1996) ,Anuradha and Suriyakumari (2002) in roselle and Pullibai (2005) in roselle. Appalaswamy <i>et al.</i> (1995) in kenaf
	Days to 50% flowering	Negative	Aruna <i>et al.</i> (1988) and Krishna Veni and Krishna Murthy (2000b).
	Plant height	Negative	Aruna <i>et al.</i> (1988) ,Krishna Veni and Krishna Murthy (2000b) and Pulli bai (2005) in roselle.
	No. of internodes per plant	Negative	Aruna <i>et al.</i> (1988) in roselle, Kantilal (1991) in kenaf.
	Internodal length	Negative	Aruna <i>et al.</i> (1988) and Pulli bai (2005) in roselle.
	Fibre-wood ratio	Negative	Aruna <i>et al.</i> (1988) in roselle.
	Fibre yield per plant	Negative	Aruna <i>et al.</i> (1988) in roselle.
	Basal stem diameter	Negative	Pulli bai (2005) in roselle ,Appalaswamy <i>et al.</i> (1995) in kenaf.
	Fibre length	Negative	Krishna Veni and Krishna Murthy (2000b) and Pullibai (2005) in roselle.
Bark thickness	Plant height	Positive	Pulli bai (2005) in roselle, Madhavi Rani (1990) and Kantilal (1991) in kenaf.

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
Fibre - wood ratio	No.of internodes per plant	Positive	Pulli bai (2005) in roselle, Madhavi Rani (1990) in kenaf.
	Fibre wood ratio	Positive	Madhavi Rani (1990) and, Kantilal (1991) in kenaf.
	Fibre length	Positive	Pulli bai (2005) in roselle Madhavi Rani (1990) and Kantilal (1991) in kenaf.
	Fibre yield per plant	Positive	Hemalatha (1990) in roselle.
	Days to 50% flowering	Positive	Kantilal (1991) in kenaf.
	Basal stem diameter	Positive	Kantilal (1991) in kenaf.
	Plant height	Negative	Hemalatha (1990) in roselle.
	Basal stem diameter	Negative	Hemalatha (1990) in roselle.
	Internodal length	Negative	Pulli bai (2005) in roselle, Madhavi Rani (1990) in kenaf
	No.of nodes per plant	Negative	Kantilal (1991) in kenaf.
	Days to 50% flowering	Negative	Pullibai (2005) in roselle.
	Fibre-wood ratio	Negative	Pullibai (2005) in roselle.
	Days to 50% flowering	Positive	Aruna <i>et al.</i> (1988) and Pullibai (2005) in roselle, Appalaswamy <i>et al.</i> (1995) in kenaf.
	No.of internodes per plant	Positive	Aruna <i>et al.</i> (1988) in roselle.
	Internodal length	Positive	Aruna <i>et al.</i> (1988) ,Guptaji (1993),Kameswara Rao (1996) and Pullibai (2005) in roselle, Sita Devi <i>et al.</i> (1990) in kenaf.

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
Fibre length	Fibre yield per plant	Positive	Aruna <i>et al.</i> (1988) in roselle.
	Fibre length	Positive	Guptaji (1993) and Kameswara Rao (1996) in roselle, Sita Devi <i>et al.</i> (1990) and Kantilal(1991) in kenaf.
	Plant height	Positive	Kantilal (1991) in kenaf, Appalaswamy <i>et al.</i> (1995) in kenaf.
	Basal stem diameter	Positive	Kantilal (1991) in kenaf, Appalaswamy <i>et al.</i> (1995) in kenaf.
	Bark thickness	Positive	Kantilal (1991) in kenaf.
	Plant height	Negative	Guptaji (1993) and Kameswara Rao (1996) in roselle, Sita Devi <i>et al.</i> (1990) in kenaf.
	No.of internodes per plant	Negative	Guptaji (1993) and, Pulli bai (2005) in roselle, Sita Devi <i>et al.</i> (1990) and, Kantilal (1991) in kenaf.
	Basal stem diameter	Negative	Guptaji (1993), Kameswara Rao (1996) and Pullibai (2005) in roselle and Sita Devi <i>et al.</i> (1990) in kenaf.
	Days to 50% flowering	Negative	Guptaji (1993) and Kameswara Rao (1996) in roselle. Sita Devi <i>et al.</i> (1990) and Kantilal (1991) in kenaf.
	Fibre yield per plant	Negative	Pulli bai (2005) in roselle.
	No. of internodes per plant	Positive	Guptaji (1993) and Kameswara Rao (1996) in roselle, Sita Devi <i>et al.</i> (1990), Madhavi Rani (1990) Efrayimu (1993) and Appalaswamy <i>et al.</i> (1995) in kenaf.

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
	Basal stem diameter	Positive	Hemalatha (1990), Guptaji (1993), Kameswara Rao (1996) and Krishna Veni and Krishna Murthy (2000b) in roselle, Sita Devi et al. (1990), Madhavi Rani (1990), Kantilal (1991) and Efrayimu (1993) in kenaf.
	Internodal length	Positive	Hemalatha (1990), Guptaji (1993) and Kameswara Rao (1996) in roselle, Madhavi Rani (1990) and Efrayimu (1993) in kenaf.
	Fibre-wood ratio	Positive	Hemalatha (1990), Guptaji (1993) and Kameswara Rao (1996) in roselle, Sita Devi et al. (1990), Kantilal (1991), Efrayimu (1993) and Appalaswamy et al. (1995) in kenaf.
	Plant height	Positive	Krishna Veni and Krishna Murthy (2000b) in roselle, Kantilal (1991) in kenaf.
	Bark thickness	Positive	Kantilal (1991) in kenaf.
	Days to 50% flowering	Positive	Appalaswamy et al. (1995) in kenaf.
	Fibre yield per plant	Positive	Krishna Veni and Krishna Murthy (2000b) in roselle.
	No. of nodes per plant	Negative	Padmaja (1989) in roselle, Kantilal (1991) in kenaf.
	Days to 50% flowering	Negative	Krishna Veni and Krishna Murthy (2000b) in roselle, Kantilal (1991) in kenaf.
	Plant height	Negative	Appalaswamy et al. (1995) in kenaf.
	Basal stem diameter	Negative	Appalaswamy et al. (1995) in kenaf.

Character showing indirect effect on yield	Character through which effect is expressed	Direction of indirect effect	Reference
Fibre yield per plant	Internodal length	Negative	Appalaswamy <i>et al.</i> (1995) in kenaf.
	Days to 50% flowering	Positive	Aruna <i>et al.</i> (1988) in roselle.
	No. of nodes per plant	Positive	Aruna <i>et al.</i> (1988) in roselle.
	Internodal length	Positive	Aruna <i>et al.</i> (1988) in roselle.
Fibre yield per plot	Plant height	Positive	Aruna <i>et al.</i> (1988) in roselle.
	Basal diameter	Positive	Aruna <i>et al.</i> (1988) in roselle.
	Number of internodes	Positive	Aruna <i>et al.</i> (1988) in roselle.
	Internodal length	Positive	Aruna <i>et al.</i> (1988) in roselle.
	Fibre weight per plant	Positive	Aruna <i>et al.</i> (1988) in roselle.
	Fibre-wood ratio	Positive	Aruna <i>et al.</i> (1988) in roselle.
	Days to 50% flowering	Positive	Aruna <i>et al.</i> (1988) in roselle.

CHAPTER - III

MATERIALS AND METHODS

3.1 MATERIAL

The material used in the present investigation consisted of 50 roselle genotypes of both exotic and indigenous origin, obtained from Agricultural Research Station, Amadalavalasa. The particulars of the genotypes are furnished in Table 2.

3.2 METHOD

The experiment was conducted at Agricultural College Farm, Bapatla located at 15°54' North Latitude and 80° 28' East Longitude at an altitude of 4.95 MSL during kharif, 2005 in a randomized complete block design with four replications. Each genotype was sown in three rows with a length of 4 m and inter and intra row spacing of 30x10 cm in black clay soil.

A basal dose of 15kg N, 20kg P₂O₅ and 20kg K₂O per hectare was applied. A top dressing of 10 kg N per hectare was applied 20 days after sowing. To raise a healthy crop recommended package of practices like irrigation, weeding and plant protection measures were attended to as and when required during the crop period.

3.2.1 Data Recorded

The crop was harvested at 50 per cent flowering stage and fibre was extracted by the standard process of retting.

Five plants per genotype per replication from the middle one row leaving the border rows and border plants within the row were chosen at random and data were recorded on the plant height (cm), number of nodes

per plant, internodal length (cm) basal stem diameter (cm), bark thickness (cm), fibre length (cm), fibre wood ratio and fibre yield per plant (g). The character means were used for statistical analysis. Data on days to 50% flowering and fibre yield per plot (g) were recorded on plot basis. Their means were used for statistical analysis.

Data were recorded on the following characters.

3.2.1.1 Days to 50% flowering

The number of days from sowing up to the flowering of 50% of plants in each plot.

3.2.1.2 Plant height (cm)

Plant height was measured from base of the stem to the tip of the plant at the time of harvest.

3.2.1.3 Number of internodes

The number of nodes on the main stem was counted at the time of harvest.

3.2.1.4 Internodal length (cm)

The length of five internodes on the main stem at the basal region were measured and the average of these was taken as mean internodal length of the stem.

3.2.1.5 Basal stem diameter (cm)

Basal stem diameter in centimeters was measured with the help of a vernier callipers.

3.2.1.6 Bark thickness (cm)

This was obtained by measuring the basal stem radius – basal wood diameter.

3.2.1.7 Fibre-wood ratio

The ratio was obtained by dividing the fibre weight by wood weight after extraction of fibre.

3.2.1.8 Fibre length (cm)

This was obtained by measuring the fibre length of the each plant after retting.

3.2.1.9 Fibre yield/plant (g)

The weight of the fibre per plant was recorded after retting.

3.2.1.10 Fibre yield/plot (g)

The weight of the fibre obtained from all the plants in a plot was recorded as fibre yield/plot after retting.

3.2.2 Statistical Analysis

The data in respect of various characters were subjected to the following statistical analysis.

- Analysis of variance, coefficient of genetic variability, heritability and genetic advance.
- Phenotypic and genotypic correlation coefficient.
- Path coefficient analysis.

- Discriminant function analysis (classical and restricted selection indices).

3.2.2.1 Analysis of variance:

Analysis of variance for the characters was done as per the standard statistical procedures for randomized block design given by Cochran and Cox (1950).

$$Y_{ij} = \mu + r_i + t_j + e_{ij}$$

Where Y_{ij} = Performance of j_{th} genotype in i_{th} block

μ = General mean

r_i = True effect of i_{th} block.

t_j = True effect of j_{th} genotype

e_{ij} = Random error.

The structure of the analysis of variance was as follows:

ANOVA table for Randomized Block Design.

Source	d.f.	S.S.	M.S.S.	F
Blocks	$r-1$	R.S.S.	$M_r = \text{RSS}/r-1$	M_r/M_e
Treatments	$t-1$	Tr.S.S.	$M_t = \text{Trss}/t-1$	M_t/M_e
Error	$(r-1)(t-1)$	E.S.S.	$M_e = \text{E.S.S.}/(r-1)(t-1)$	
Total	$(rt-1)$	T.S.S.		

d.f. = Degrees of freedom

where r = Number of replications

t = Number of treatments (genotypes)

S.S. = Sum of squares

M.S.S. = Mean sum of squares

Tr.S.S. = Treatment sum of squares

R.S.S. = Block sum of squares

E.S.S. = Error sum of squares

M_r = Block mean sum of squares.

$$\text{Genotypic variance } \sigma_g^2 = \frac{M_t - M_e}{r}$$

where M_t = Treatment mean sum of squares

M_e = Error mean sum of squares

r = Number of replications

$$\text{Phenotypic variance } \sigma_p^2 = \sigma_g^2 + \sigma_e^2$$

Where σ_g^2 = Genotypic variance

σ_e^2 = Environmental variance

Co-efficient of variation:

The co-efficients of variation were calculated using the formulae adopted by Burton and Devane (1953).

Genotypic co-efficient of variation (GCV):

$$\text{GCV (\%)} = \frac{\sqrt{\sigma_g^2}}{\bar{x}} \times 100$$

Where $\sqrt{\sigma_g^2}$ = Genotypic standard deviation

$\bar{x}$ = General mean of the character

Phenotypic co-efficient of variation (PCV):

$$\text{PCV (\%)} = \frac{\sqrt{\sigma_p^2}}{\bar{x}} \times 100$$

Where $\sqrt{\sigma_p^2}$ = Phenotypic standard deviation

$\bar{x}$ = General mean of the character

Heritability in broad sense: Heritability in broad sense was estimated according to the formula given by Allard (1960).

$$h^2(b) = \frac{\sigma_g^2}{\sigma_p^2} \times 100$$

Where $h^2(b)$ = Heritability in broad sense

σ_g^2 = Genotypic variance

σ_p^2 = Phenotypic variance

σ_e^2 = Environmental variance

The range of heritability in broad sense [$h^2(b)$] was classified as suggested by Johnson *et al.* (1955).

Low = Less than 30%

Moderate = 30-60%

High = More than 60%

EXPECTED GENETIC ADVANCE: From the heritability estimates the expected genetic advance was worked out according to Allard (1960).

$$G.A. = k \times \sqrt{\sigma_p^2} \times h^2(b)$$

where G.A. = Expected genetic advance

K = A constant for a certain per cent of selection
(2.06 at 5% level)

$\sqrt{\sigma_p^2}$ = Phenotypic standard deviation

$h^2(b)$ = Heritability in broad sense

Genetic Advance as per cent of Mean (GAM):

$$\text{GAM} = \frac{\text{GA}}{\bar{x}} \times 100$$

GAM = Genetic Advance as per cent of Mean

GA = Genetic Advance

$\bar{x}$ = Grand mean

3.2.2.2 Genotypic and Phenotypic correlations

Genotypic and phenotypic correlations were worked out by using the formula suggested by Falconer (1964).

Genotypic coefficient of correlation (r_g):

$$r(x_i x_j)_g = \text{Cov}(x_i x_j)_g / \sqrt{v(x_i)_g} \cdot \sqrt{v(x_j)_g}$$

where $r(x_i x_j)_g$ = Genotypic correlation between i^{th} and j^{th} character.

$v(x_i)_g$ = Genotypic variance of i^{th} character.

$v(x_j)_g$ = Genotypic variance of j^{th} character.

$\text{Cov}(x_i x_j)_g$ = Genotypic covariance between i^{th} and j^{th} character.

Phenotypic coefficient of correlation (r_p):

$$r(x_i x_j)_p = \text{Cov}(x_i x_j)_p / \sqrt{v(x_i)_p} \cdot \sqrt{v(x_j)_p}$$

where $r(x_i x_j)_p$ = Phenotypic correlation between i^{th} and j^{th} character.

$\text{Cov}(x_i x_j)_p$ = Phenotypic covariance between i^{th} and j^{th} character.

$v(x_i)_p$ = Phenotypic variance of i^{th} character.

$v(x_j)_p$ = Phenotypic variance of j^{th} character.

Significance of correlation coefficients were tested by comparing phenotypic correlation coefficients with the table values (Fisher and Yates, 1963) at (n-2) degrees of freedom at 5% and 1% level, where “n” denotes the number of paired observations used in the calculation.

3.2.2.3 Path coefficient analysis

The direct and indirect contribution of various characters were calculated through path coefficient analysis as suggested by Wright (1921) and elaborated by Dewey and Lu (1959).

The following set of simultaneous equations were formed and solved for estimating various direct and indirect effects.

$$\begin{aligned} r_{1y} &= p_{1y} + r_{12}p_{2y} + r_{13}p_{3y} + \dots + r_{1k}p_{ky} \\ r_{2y} &= r_{21}p_{1y} + p_{2y} + r_{23}p_{3y} + \dots + r_{2k}p_{ky} \\ &\vdots \\ r_{ky} &= r_{k1}p_{1y} + r_{k2}p_{2y} + r_{k3}p_{3y} + \dots + p_{ky} \end{aligned}$$

where r_{1y} to r_{ky} = Coefficient of correlation between causal factors 1 to k and dependent character y.

r_{12} to r_{k-1} , k = Coefficient of correlation among causal factors.

p_{1y} to p_{ky} = Direct effects of characters 1 to k on character y.

The above equations were written in a matrix form as given below:

$$\begin{matrix} \text{A} & & \text{C} & & \text{B} \\ \begin{pmatrix} r_{1y} \\ r_{2y} \\ r_{3y} \\ \vdots \end{pmatrix} & = & \begin{pmatrix} 1 & r_{12} & r_{13} & \dots & r_{1k} \\ r_{21} & 1 & r_{23} & \dots & r_{2k} \\ r_{31} & r_{32} & 1 & \dots & r_{3k} \\ \vdots & \vdots & \vdots & \dots & \vdots \end{pmatrix} & \cdot & \begin{pmatrix} p_{1y} \\ p_{2y} \\ p_{3y} \\ \vdots \end{pmatrix} \end{matrix}$$

$$\begin{array}{ccccccc}
 : & : & : & \dots\dots\dots & : & : \\
 r_{ky} & r_{k1} & r_{k2} & r_{k3} & \dots\dots\dots & 1 & p_{ky}
 \end{array}$$

$$\text{Then } B = C^{-1}A$$

$$\text{Where } C^{-1} = \begin{pmatrix} C_{11} & C_{12} & C_{13} & \dots\dots & C_{1k} \\ C_{21} & C_{22} & C_{23} & \dots\dots & C_{2k} \\ C_{k1} & C_{k2} & C_{k3} & \dots\dots & C_{lk} \end{pmatrix}$$

Then, direct effects were calculated as follows:

$$P_{1y} = \sum_{i=1}^k C_{1i} r_{iy}$$

$$P_{2y} = \sum_{i=1}^k C_{2i} r_{iy}$$

$$P_{ky} = \sum_{i=1}^k C_{ki} r_{iy}$$

Residual effect:

In plant breeding it is very difficult to have complete knowledge of all component traits of yield. The residual effect permits precise explanation about the pattern of interaction of other possible components of yield. In other words, residual effect measures the role of other possible independent variables which were not included in the study on the dependent variable. The residual effect is estimated with the help of direct effects and simple correlation coefficient.

$$1 = P^2 R_y + \sum P_{iy} r_{iy}$$

where P_2R_y is the square of residual effect.

3.2.2.4 Discriminant function

The phenotype of the plant represented by the relation given by Fisher (1936).

$$Z = b_1x_1 + b_2x_2 + \dots + b_nx_n$$

Where $x_1, x_2, x_3 \dots x_n$ are variables measured and

$b_1, b_2, b_3 \dots b_n$ are their weighing coefficients.

3.2.2.4.1 Classical selection indices

Application of discriminant function as a basis for making selection on several characters simultaneously was aimed at discriminanting the desirable genotypes from undesirable ones on the basis of their phenotypic performance.

The genetic worth (H) of an individual as defined by Smith (1936) was:

$$H = a_1G_1 + a_2G_2 + \dots + a_nG_n$$

Where $G_1, G_2, G_3 \dots G_n$ are the genotypic values of individual characters and $a_1, a_2 \dots a_n$ signify their relative economic importance. Another function (I) based on the phenotypic performance of various characters was defined as:

$$I = b_1p_1 + b_2p_2 + \dots + b_np_n$$

Where $b_1, b_2 \dots b_n$ were to be estimated such that the correlation between H and I i.e. $r(H, I)$ becomes maximum. When once such function

was obtained, discrimination of good genotype from the undesirable ones will be possible on the basis of phenotypic performance i.e., $p_1, p_2, \dots, p_n$ directly.

Using all the 10 characters studied, the maximization of $r(H, I)$ leads to a set of simultaneous equations which upon solving give the desired estimate of " b_i " values. The economic weights i.e., " a_i " values used in the study were the reciprocals of the means of the respective 10 characters.

Considering the 10 characters the simultaneous equations look like:

$$\begin{aligned} b_1X_{11} + b_2X_{12} + \dots + b_iX_{1n} &= a_1G_{11} + a_2G_{12} + \dots + a_iG_{1n} \\ b_1X_{21} + b_2X_{22} + \dots + b_iX_{2n} &= a_1G_{21} + a_2G_{22} + \dots + a_iG_{2n} \\ b_1X_{31} + b_2X_{32} + \dots + b_iX_{3n} &= a_1G_{31} + a_2G_{32} + \dots + a_iG_{3n} \\ &\vdots \\ b_1X_{m1} + b_2X_{m2} + \dots + b_iX_{mn} &= a_1G_{m1} + a_2G_{m2} + \dots + a_iG_{mn} \end{aligned}$$

The above equations were written in matrix form as follows:

$$\begin{pmatrix} X_{11} & X_{12} & \dots & X_{1n} \\ X_{21} & X_{22} & \dots & X_{2n} \\ \vdots & \vdots & & \vdots \\ \vdots & \vdots & & \vdots \\ X_{m1} & X_{m2} & \dots & X_{mn} \end{pmatrix} \cdot \begin{pmatrix} b_1 \\ b_2 \\ \vdots \\ \vdots \\ b_i \end{pmatrix} = \begin{pmatrix} G_{11} & G_{12} & \dots & G_{1n} \\ G_{21} & G_{22} & \dots & G_{2n} \\ \vdots & \vdots & & \vdots \\ \vdots & \vdots & & \vdots \\ G_{m1} & G_{m2} & \dots & G_{mn} \end{pmatrix} \cdot \begin{pmatrix} a_1 \\ a_2 \\ \vdots \\ \vdots \\ a_i \end{pmatrix}$$

where $m = n = \text{Number of characters (10)}$

The solution of this equation gave the estimate of " b_i " values as $b = x^{-1}Ga$

Where $b = \text{Column vector}$

$x^{-1} = \text{inverse of phenotypic variance and covariance matrix}$

$G = \text{genotypic variance and covariance matrix.}$

A = Column vector for economic weights.

Expected genetic advance: The expected genetic advance, by constructing different discriminant functions was calculated and relative efficiency of each discriminant function was estimated as per Robinson *et al.* (1951).

$$\Delta G_i = \frac{\sum_j b_j G_{ij}}{\sqrt{\sum_j b_i G_i}}$$

where ΔG_i = Expected genetic advance in ith character.

K = Selection differential (2.06 at 5% level)

b_j and b_i = Regression coefficient

G_i and G_{ij} = Genotypic variance and covariance.

The relative efficiency of the discriminant function which includes fibre weight per plot alone was taken as 100% and the relative efficiencies of other function were estimated with reference to this.

3.2.2.4.2 Restricted selection indices:

The restricted selection indices as per Kempthorne and Nordskog (1959) were computed following single restriction case for all the 10 characters.

When a character was restricted i.e., the genetic gain is zero ($\Delta G=0$), the maximization of the correlation between H and I was obtained using the following formula.

$$b = [I_{nn} - P^{-1} G C (C^1 G P^{-1} G C)^{-1} C^1 G] P^{-1} G a$$

When I_{nn} = n x n unit matrix

P^{-1} = inverse of phenotypic variance and covariance matrix.

G = Genotypic variance and covariance matrix

C = Coefficient vector matrix

C^{-1} = Transposed coefficient vector matrix.

For eg: (i) for $G_1 = 0$ and G_2 to G_{10} were unrestricted

$C^{-1} = (1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0)$ is a vector

(ii) for $G_2 = 0$ and G_1, G_3 to G_{10} were unrestricted.

$C^{-1} = 0 \ (0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0)$ is a vector

Genetic advance:

The genetic advance (ΔG_i) was calculated using the following formula.

$$\Delta G_i = \frac{Gb}{\sqrt{a^1 Gb}}$$

Where $a^1 Gb$ = Standard deviation of b (restricted)

ΔG_i = Genetic advance in i_{th} character.

G = Genotypic variance and covariance matrix

b = Weighing coefficients

a^1 = Transposed vector of economic weights.

Table 2. Source of origin and some important traits of the 50 selected genotypes of roselle hemp (*Hibiscus sabdariffa* L.)

S.No	Genotype	Origin	Morphological Characters
1.	AR-34	Indigenous local collection	Red Stem, green lobed leaf, yellow purple flower, bristled pubescence.
2.	8409-8408/68	Indigenous local collection	Red stem, green lobed leaf, pink flower, smooth pubescence.
3.	AS-81-12	Indigenous local collection	Red stem, green lobed leaf, yellow flower, bristled stem pubescence.
4.	R-174	Indigenous local collection	Red stem, green lobed leaf, yellow purple flower, smooth pubescence.
5.	R-11	Indigenous local collection	Green and nodal pigmented stem, green lobed leaf, yellow purple flower, bristled pubescence
6.	AR-118	Indigenous local collection	Red stem, green lobed leaf, yellow-purple flower, bristled pubescence
7.	AR-40	Indigenous local collection	Red stem, green leaf, yellow purple flower, bristled stem pubescence
8.	R-51	Indigenous local collection	Dark pink stem, green leaf, yellow-purple flower, smooth pubescence.
9.	R-35	Indigenous local collection	Green and nodal pigmented stem, green leaf, yellow purple flower, bristled pubescence.
10.	AR 82	Indigenous local collection	Red stem, green leaf, yellow purple flower, bristled pubescence
11.	8404-8408 /68	Indigenous local collection	Red stem, green leaf, pink purple flowers, smooth pubescence.
12.	AR-72	Indigenous local collection	Red stem, entire green leaf, yellow-purple flower, bristled pubescence.
13.	8444-8448/68	Indigenous local collection	Green stem, entire green leaf, yellow flower, bristled pubescence.

S.No	Genotype	Origin	Morphological Characters
14.	R-237	Indigenous local collection	Green stem, entire green leaf, yellow flower, bristled pubescence.
15.	R-283	Indigenous local collection	Green and nodal pigmented stem green lobed leaf, yellow purple flower, hairy stem pubescence.
16.	AR 10	Indigenous local collection	Red stem, green leaf yellow purple flower, hairy stem pubescence.
17.	R-319	Indigenous local collection	Green and nodal pigmented stem, entire green leaf, yellow-purple flower, hairy stem pubescence.
18.	AR-54	Indigenous local collection	Red stem, green lobed leaf, yellow-purple flower, hairy stem pubescence.
19.	R-286	Indigenous local collection	Green and nodal pigmented stem, entire green leaf, yellow –purple flower, hairy stem pubescence.
20.	R-292	Indigenous local collection	Green and nodal pigmented stem, green lobed leaf, yellow purple flower, hairy stem pubescence.
21.	AR-127	Indigenous local collection	Green stem and leaf, yellow flower, hairy pubescence.
22.	8459-8463/68	Indigenous local collection	Red stem, entire red tinged leaf, yellow –purple flower, hairy pubescence.
23.	AS-81-11	Indigenous local collection	Green stem and leaf, yellow flower, hairy stem pubescence.
24.	R-258	Indigenous local collection	Red stem, green lobed leaf, yellow purple flower, smooth pubescence.
25.	8434-8438/68	Indigenous local collection	Red stem, green lobed leaf, yellow-purple flower, hairy pubescence.

S.No	Genotype	Origin	Morphological Characters
26.	AR 90	Indigenous local collection	Red stem, green lobed leaf, yellow-purple flower, no stem pubescence.
27.	R-129	Indigenous local collection	Red stem, green lobed leaf, yellow purple flower, smooth stem pubescence.
28.	AR-68	Indigenous local collection	Red stem, green lobed leaf, yellow purple flower, hairy stem pubescence.
29.	R-86	Indigenous local collection	Green and nodal pigmented stem, green leaf, yellow purple flower, hairy stem pubescence.
30.	R-45	Indigenous local collection	Green stem and leaf, yellow flower, smooth pubescence.
31.	6283-4044	Indigenous local collection	Red stem, green lobed leaf, yellow –purple flower, hairy stem pubescence.
32.	AS-80-23	Indigenous local collection	Green stem and leaf, yellow flower, smooth pubescence.
33.	AR-51	Indigenous local collection	Red stem, green lobed leaf, yellow –purple flower, hairy stem pubescence.
34.	R-342	Indigenous local collection	Green and nodal pigmented stem, entire green leaf, yellow purple flower, hairy pubescence.
35.	AS-81-18	Indigenous local collection	Green stem and leaf, yellow – flower, hairy stem pubescence.
36.	R-28	Indigenous local collection	Green and nodal pigmented stem, entire green leaf, yellow purple flower, hairy pubescence.
37.	AMV-4 (AMV-1 x As-163)	Indigenous local collection	Pink stem, entire green leaf, yellow-purple flower, smooth pubescence.

S.No	Genotype	Origin	Morphological Characters
38.	RT-768	CRIJAF (Barrackpore)	Red stem, green lobed leaf, yellow-purple flower, smooth pubescence.
39.	ER 51A	Exotic collection	Green stem, entire green leaf ,yellow-purple flower, hairy pubescence.
40.	ER 51	Exotic collection	Red stem, entire red tinged leaf, yellow purple flower, hairy pubescence.
41.	ER 26	Exotic collection	Red stem, green lobed leaf, yellow –purple flower, hairy pubescence.
42.	ER 63	Exotic collection	Green stem and leaf, yellow-purple flower, hairy pubescence.
43.	ER 33	Exotic collection	Red stem, green lobed leaf, yellow-purple flower, prickly pubescence.
44.	ER 57	Exotic collection	Red stem, green lobed leaf, yellow-purple flower, hairy pubescence.
45.	ER 58	Exotic collection	Red stem, green leaf, yellow-purple flower, hairy pubescence.
46.	ER 44	Exotic collection	Red stem, green leaf, yellow-purple flower, smooth stem pubescence.
47.	ER 35A	Exotic collection	Green stem, Greenleaf, yellow-purple flower, smooth stem pubescence.
48.	ER 65	Exotic collection	Red stem and entire green leaf, yellow flower, hairy stem pubescence.
49.	ER 56	Exotic collection	Green stem and green lobed leaf, yellow-purple flower, hairy pubescence.
50	ER 7	Exotic collection	Red stem, green leaf, yellow – purple flower, hairy pubescence.

CHAPATER - IV

RESULTS

The results obtained from the present investigation consisting of 50 genotypes of roselle, on 10 characters are presented under the following heads.

- (1) Analysis of variance, coefficient of genetic variability heritability and genetic advance.
- (2) Phenotypic and genotypic correlation coefficient
- (3) Path coefficient analysis
- (4) Discriminant function analysis

4.1 ANALYSIS OF VARIANCE, COEFFICIENT OF GENETIC VARIABILITY, HERITABILITY AND GENETIC ADVANCE

4.1.1 Means

The mean performance of 10 characters among 10 characters are presented in the Table 3. The results indicated the presence of considerable variability among the genotypes for all the characters studied.

4.1.2 Analysis of Variance

Analysis of variance was carried out for all the characters and the data was presented in the Table 4. The results indicated that the treatment mean squares were significant for all the characters indicating substantial variation for various characters. The replication mean squares were non significant for all the characters except fibre-wood ratio.

The character days to 50% flowering ranged from 86.7 to 120 days with a mean value of 106.6 days. While plant height showed a range of 84.62 cm to 170.9 cm with a mean value of 126.38 cm, number of internodes

ranged from 21.9 to 49.3 with a mean of 27.4, internodal length ranged from 2.57 cm to 5.52 cm with a mean of 3.95 cm, basal stem diameter ranged from 0.82 cm to 2.65 cm with a mean value of 1.78 cm, bark thickness ranged from 0.15 cm to 0.64cm with a mean of 0.29 cm, fibre–wood ratio from 0.23 to 0.56 with a mean value of 0.37, fibre length ranged from 71.10 cm to 154.45 cm with a mean value of 110.40 cm, fibre yield per plant ranged from 3.92 to 15.67 with a mean value of 6.73 g and fibre yield per plot showed a range of 471 g to 1302 g with a mean value of 794.25 g

4.1.3 Coefficient of Genetic Variability Heritability and Genetic Advance

The estimates of genetic variability, heritability and genetic advance as per cent of mean for all the characters were presented in the Table 5.

4.1.3.1 Days to 50% flowering

Among all the 50 genotypes 6283-4044 was found to be late as it attended 50 per cent flowering in 120.25 days while, the genotype ER-44 was found to be early (86.75). The phenotypic coefficient of variation (8.14) and genotypic coefficient of variation (8.08) were low for this trait. High heritability (98.6%) coupled with moderate genetic advance percent of mean (16.53) was recorded for this trait.

4.1.3.2 Plant height

The genotype ER 35A recorded maximum plant height (170.92 cm) while, the genotype AR 68 recorded minimum plant height (84.62 cm). The phenotypic coefficient of variation (14.18) and genotypic coefficient of variation (13.89) were moderate for this trait. High heritability (96%) coupled

with high genetic advance as per cent of mean (28.04) was recorded for this trait.

4.1.3.3. Number of internodes per plant

The genotype ER 35A recorded maximum number of internodes per plant (49.3) While the genotype AR 68 recorded minimum number of internodes per plant (21.97). The phenotypic coefficient of variation (14.79) and the genotypic coefficient of variation (14.67) were moderate for this trait. High heritability (98.3%) coupled with high genetic advance as per cent of mean (29.96) was recorded for this trait.

4.1.3.4 Internodal length

The genotype ER 57 recorded maximum internodal length of plant (5.52) while, the genotype AR 34 recorded minimum internodal length (2.57). The phenotypic coefficient of variation (15.95) and genotypic coefficient of variation (15.12) were moderate for this trait. High heritability (89.9%) coupled with high genetic advance as percent of mean (29.55) was recorded for this trait.

4.1.3.5 Basal stem diameter

The genotype 6283-4044 recorded maximum basal stem diameter (2.65) while, the genotype R 319 recorded minimum basal stem diameter (0.82). The phenotypic coefficient of variation (23.49) and genotypic coefficient of variation (23.00) were high for this trait. High heritability (95.8%) coupled with high genetic advance as per cent of mean (46.37) was recorded for this trait.

4.1.3.6 Bark thickness

The genotype 6283-4044 recorded maximum bark thickness (0.64) while, the genotype R 292 recorded minimum bark thickness (0.15). The phenotypic coefficient of variation (43.39) and genotypic coefficient of variation (43.00) were high for this trait. High heritability (98.2%) coupled with high genetic advance as per cent of mean (87.76) was recorded for this trait.

4.1.3.7 Fibre-wood ratio

The genotype AR-68 recorded maximum fibre-wood ratio (0.56) while, the genotype ER-56 recorded minimum fibre-wood ratio (0.23). The phenotypic coefficient of variation (25.95) and genotypic coefficient of variation (25.77) were high for this trait. High heritability (98.6%) coupled with high genetic advance as per cent of mean (52.72) was recorded for this trait.

4.1.3.8 Fibre length

The genotype ER-35A recorded maximum fibre length (154.45) while, the genotype AR-68 recorded minimum fibre length (71.10). The phenotypic coefficient of variation (15.51) and genotypic coefficient of variation (15.09) were moderate for trait. High heritability (94.6) coupled with high genetic advance as per cent of mean (30.23%) was recorded for this trait.

4.1.3.9 Fibre yield/plant(g)

The genotype ER 35A recorded maximum fibre yield/plant (15.67) while, the genotype R-174 recorded minimum fibre yield/plant (3.92). The phenotypic coefficient of variation (31.90) and genotypic coefficient of

variation (31.86) were high for this trait High heritability (99.8%) coupled with high genetic advance as per cent of mean (65.55) was recorded for this trait.

4.1.3.10 Fibre yield/plot(g)

The genotype ER 35A recorded maximum fibre yield/plot (1302.00) while, the genotype R-174 recorded minimum fibre yield/plot (471.0). The phenotypic coefficient of variation (28.44) and genotypic coefficient of variation (27.92) were high for this trait. High heritability (96.3%) coupled with high genetic advance as per cent of mean (56.44) was recorded for this trait.

4.2 PHENOTYPIC AND GENOTYPIC CORRELATION COEFFICIENTS

The genotypic and phenotypic correlation coefficients between yield and its components and among the characters themselves are presented in tables 6 and 7. The results revealed that genotypic correlations were higher than the phenotypic correlations for all the characters studied.

4.2.1 Days to 50% flowering

It had exhibited positive non significant association with fibre yield / plot ($r_g = 0.0995$, $r_p = 0.0955$), fibre yield per / plant ($r_g = 0.1099$, $r_p = 0.1092$), fibre length ($r_g = 0.0431$, $r_p = 0.0367$), number of internodes ($r_g = 0.0303$, $r_p = 0.0307$) and plant height ($r_g = 0.0414$, $r_p = 0.0356$) both at genotypic and phenotypic levels. It also showed negative non significant association with fibre-wood ratio ($r_g = -0.0504$, $r_p = -0.0499$), bark thickness ($r_g = -0.0605$, $r_p = -0.0588$), basal stem diameter ($r_g = -0.0847$, $r_p = -0.0791$), internodal length ($r_g = -0.0503$, $r_p = -0.0538$) both at genotypic and phenotypic levels.

4.2.2 Plant height

This trait had a significant positive association with fibre yield / plot ($r_g = 0.7602$, $r_p = 0.7359$) fibre yield / plant ($r_g = 0.7641$, $r_p = 0.7468$), fibre length ($r_g = 0.9999$, $r_p = 0.9914$), bark thickness ($r_g = 0.6212$, $r_p = 0.6040$), basal stem diameter ($r_g = 0.8428$, $r_p = 0.8058$), no. of inter nodes ($r_g = 0.8221$, $r_p = 0.7973$). It also exhibited positive non significant association with days to 50% flowering ($r_g = 0.0414$, $r_p = 0.0356$). Its association with fibre – wood ratio ($r_g = -0.4075$, $r_p = -0.3932$), internodal length ($r_g = -0.7917$, $r_p = -0.6613$) was negative significant both at genotypic and phenotypic levels.

4.2.3 Number of internodes

This trait had a significant positive association with fibre yield / plot ($r_g = 0.6988$, $r_p = 0.6787$), fibre yield / plant ($r_g = 0.8404$, $r_p = 0.8319$), fibre length ($r_g = 0.8360$, $r_p = 0.8096$), bark thickness ($r_g = 0.5057$, $r_p = 0.4949$), basal stem diameter ($r_g = 0.6872$, $r_p = 0.6672$), plant height ($r_g = 0.8221$, $r_p = 0.7973$) and it showed non significant positive association with days to 50% flowering ($r_g = 0.0303$, $r_p = 0.0307$). It also exhibited significant negative association with fibre-wood ratio ($r_g = -0.1872$, $r_p = -0.1852$) and internodal length ($r_g = -0.6195$, $r_p = -0.5866$).

4.2.4 Internodal length

Internodal length exhibited significant negative association with fibre yield / plot ($r_g = -0.6056$, $r_p = -0.5644$), fibre yield / plant ($r_g = -0.5637$, $r_p = -0.5336$), fibre length ($r_g = -0.7347$, $r_p = -0.6677$), bark thickness ($r_g = -0.3885$, $r_p = -0.3675$), basal stem diameter ($r_g = -0.5418$, $r_p = -0.4996$), number of internodes ($r_g = -0.6195$, $r_p = -0.5866$), plant height ($r_g = -0.7197$,

$r_p = -0.6613$) and showed non-significant negative association with days to 50% flowering ($r_g = -0.0503, r_p = -0.0538$) both at genotypic and phenotypic level. It's association with fibre wood ratio ($r_g = 0.3613, r_p = 0.3428$) was positive and significant at genotypic and phenotypic level.

4.2.5 Basal stem diameter

Basal stem diameter showed significant positive association with fibre yield/plot ($r_g = 0.6523, r_p = 0.5968$), fibre yield/plant ($r_g = 0.6206, r_p = 0.6066$), fibre length ($r_g = 0.8435, r_p = 0.7993$), bark thickness ($r_g = 0.7479, r_p = 0.7262$), number of internodes ($r_g = 0.6872, r_p = 0.6672$), plant height ($r_g = 0.8428, r_p = 0.8058$). It showed negative significant association with fibre-wood of ratio ($r_g = -0.2920, r_p = -0.2856$) and internodal length ($r_g = -0.5418, r_p = -0.4996$). It also revealed the nonsignificant negative association with days to 50% flowering ($r_g = -0.0847, r_p = -0.0791$) both at genotypic and phenotypic levels.

4.2.6 Bark thickness

Bark thickness exhibited significant positive association with fibre yield/plot ($r_g = 0.5140, r_p = 0.5006$), fibre yield/plant ($r_g = 0.5129, r_p = 0.5072$), fibre length ($r_g = 0.6264, r_p = 0.6012$), basal stem diameter ($r_g = 0.7479, r_p = 0.7262$), number of internodes ($r_g = 0.5057, r_p = 0.4949$), plant height ($r_g = 0.6212, r_p = 0.6040$), both at genotypic and phenotypic levels. It showed significant negative association with internodal length ($r_g = -0.3885, r_p = -0.3675$) both at genotypic and phenotypic level. It exhibited negative non significant association with fibre-wood ratio ($r_g = -0.0206, r_p = -0.0194$).

4.2.7 Fibre – wood ratio

Fibre-wood ratio showed significant negative correlation with fibre yield /plot ($r_g = -0.2861, r_p = -0.2781$), fibre yield / plant ($r_g = -0.1846, r_p = -0.1834$) fibre length ($r_g = -0.3799, r_p = -0.3639$), basal stem diameter ($r_g = -0.2920, r_p = -0.2856$), number of internodes ($r_g = -0.1872, r_p = -0.1852$) and plant height ($r_g = -0.4075, r_p = -0.3932$) both at genotypic and phenotypic level. It's association with internodal length ($r_g = 0.3613, r_p = 0.3428$) was positive significant at genotypic and phenotypic levels. It had negative non significant association with days to 50% flowering ($r_g = -0.0504, r_p = -0.0499$) and bark thickness ($r_g = -0.0206, r_p = -0.0194$).

4.2.8 Fibre length

Fibre length showed significant positive correlation with fibre yield /plot ($r_g = 0.7691, r_p = 0.7389$), fibre yield/plant ($r_g = 0.7766, r_p = 0.7538$), bark thickness ($r_g = 0.6264, r_p = 0.6012$), basal stem diameter ($r_g = 0.8435, r_p = 0.7993$), number of internodes ($r_g = 0.8360, r_p = 0.8096$) and plant height ($r_g = 0.9999, r_p = 0.9914$) both at genotypic and phenotypic level. It showed non- significant positive correlation with days to 50% flowering and also showed significant negative correlation with fibre wood ratio ($r_g = -0.3799, r_p = -0.3639$) and internodal length ($r_g = -0.7347, r_p = -0.6677$) both at genotypic and phenotypic level.

4.2.9 Fibre yield /plant

Fibre yield/plant showed significant positive correlation with fibre yield/plot ($r_g = 0.9529, r_p = 0.9353$), fibre length ($r_g = 0.7766, r_p = 0.7538$), bark thickness ($r_g = 0.5129, r_p = 0.5072$), basal stem diameter ($r_g = 0.6206,$

$r_p=0.6066$), number of internodes ($r_g = 0.8404$, $r_p = 0.8319$), plant height ($r_g = 0.7641$, $r_p=0.7468$) and days to 50% flowering ($r_g = 0.1099$, $r_p= 0.1092$) both at genotypic and phenotypic level and negative significant correlation with internodal length ($r_g = -0.5637$, $r_p= -0.5336$) and fibre-wood ratio ($r_g=-0.1846$, $r_p= -0.1834$) both at genotypic and phenotypic level. It had positive non significant association with days to 50% flowering.

4.2.10 Fibre yield/plot

This trait recorded significant positive association with fibre yield per plant ($r_g = 0.9529$, $r_p = 0.9353$), fibre length ($r_g = 0.7691$, $r_p = 0.7389$), bark thickness ($r_g = 0.5140$, $r_p = 0.5006$), basal stem diameter ($r_g = 0.6523$, $r_p=0.5968$), number of internodes ($r_g = 0.6988$, $r_p = 0.6787$), plant height ($r_g = 0.7602$, $r_p = 0.7359$) and significant negative correlation with fibre-wood ratio ($r_g = -0.2861$, $r_p= -0.2781$), internodal length ($r_g = -0.6056$, $r_p= -0.5644$) and non-significant positive association with days to 50% flowering ($r_g = 0.0995$, $r_p= 0.0955$) both at genotypic and phenotypic level.

4.3 PATH COEFFICIENT ANALYSIS

The correlation coefficients do not project the complete picture especially when the causal factors are interrelated. The correlation coefficients between fibre yield / plot and each of its component characters was partitioned into the corresponding direct and indirect effects through path coefficient analysis. The path coefficients of different attributes on fibre yield / plot based on the genotypic and phenotypic correlation in *Hibiscus sabdariffa* (L). are embodied in table 8 and 9.

4.3.1 Days to 50% flowering

At the genotypic level this trait had negative direct effect (-0.0225) and negative indirect effects via number of internodes (-0.0158), basal stem diameter (-0.0060) and fibre length (-0.0336). This trait had positive indirect effects via plant height (0.0367), internodal length (0.0074), bark thickness (0.0005), fibre-wood ratio (0.0013) and fibre yield/plant (0.1314). Its correlation with fibre yield/plot was positive (0.0995) and non significant.

This trait had negative direct effect (-0.0252) on fibre yield / plot and negative indirect effects via plant height (-0.0024), number of internodes (-0.0153), basal stem diameter (-0.0025), bark thickness (-0.0005). This trait had positive indirect effects via internodal length (0.0054) fibre – wood ratio (0.0031), fibre length (0.0085) and fibre yield / plant (0.1245). Its correlation with fibre yield / plot was positive and non-significant (0.0955) at phenotypic level.

4.3.2 Plant height

At the genotypic level this trait showed positive direct effect (0.8863) and positive indirect effects via internodal length (0.1059), basal stem diameter (0.0594), fibre-wood ratio (0.0105) and fibre yield/plant (0.9134). This trait had negative indirect effects via days to 50% flowering (-0.0009), number of internodes (-0.4284), bark thickness (-0.0056) and fibre length (-0.7804). Its correlation with fibre yield/plot was significant positive (0.7602).

This trait showed negative direct effect (-0.0681) and had negative indirect effects via days to 50% flowering (-0.0009) and number of

internodes (-0.3692) and positive effect via internodal length (0.0659), basal stem diameter (0.0253), bark thickness (0.0050), fibre-wood ratio (0.0243), fibre length (0.2286) and fibre yield / plant (0.8519) at phenotypic level. Its correlation with fibre yield / plot was significant and positive (0.7359) at phenotypic level.

4.3.3 Number of internodes

This trait exhibited negative direct effect (-0.5212) and negative indirect effects via days to 50% flowering (-0.0007), bark thickness (-0.0046) and fibre length (-0.6524) and positive indirect effects via plant height (0.7286), internodal length (0.0912), basal stem diameter (0.0484), fibre-wood ratio (0.0048) and fibre yield/plant (1.0046). Its correlation with fibre yield/plot was significant positive (0.6988) at the genotypic level.

This trait exhibited negative direct effect (-0.4969) and negative indirect effects via days to 50% flowering (-0.0008) and plant height (-0.0543). This trait also exhibited positive indirect effect via internodal length (0.0585), basal stem diameter (0.0210), bark thickness (0.0041), fibre–wood ratio (0.0114), fibre length (0.1867) and fibre yield / plant (0.9490) at phenotypic level. Its correlation with fibre yield / plot was significant and positive (0.6787) at phenotypic level.

4.3.4 Internodal length

At the genotypic level this trait showed negative direct effect (-0.1472) and had negative indirect effect via plant height (-0.6379), basal stem diameter (-0.0382), fibre-wood ratio (-0.0093) and fibre yield/plant (-0.6739) and exhibited positive indirect effects via days to 50% flowering (0.0011),

number of internodes (0.3228), bark thickness (0.0035) and fibre length (0.5734). Its correlation with fibre yield/plot was significant negative (-0.6056) at genotypic level.

At phenotypic level this trait showed negative direct effect (-0.0997) and had negative indirect effects via basal stem diameter (-0.0157), bark thickness (0.0030), fibre-wood ratio (-0.0212), fibre length (-0.1540) and fibre yield / plant (-0.6087). This trait had positive indirect effects via days to 50% flowering (0.0014), plant height (0.0450) and number of internodes (0.2915) and its correlation with fibre yield / plot was significant and negative (-0.5644) at phenotypic level.

4.3.5 Basal stem diameter

At the genotypic level this trait showed positive direct effect (0.0705) and positive indirect effects via days to 50% flowering (0.0019), plant height (0.7469), internodal length (0.0797), fibre-wood ratio (0.0075) and fibre yield/plant (0.7419) and exhibited negative indirect effects via number of internodes (-0.3581), bark thickness (-0.0068) and fibre length (-0.6583). Its correlation with fibre yield/plot was significant positive (0.6253).

At the phenotypic level this trait showed positive direct effect (0.0314) and positive indirect effects via days to 50% flowering (0.0020), internodal length (0.0498), bark thickness (0.0060), fibre-wood ratio (0.0176), fibre length (0.1843) and fibre yield / plant (0.6920) and exhibited negative indirects via plant height (-0.0548) and number of internodes (-0.3315). Its correlation with fibre yield / plot was significant and positive (0.5968) at phenotypic level.

4.3.6 Bark thickness

At the genotypic level this trait exhibited negative direct effect (-0.0091) and negative indirect effects via number of internodes (-0.2635) and fibre length (-0.4889). It also showed positive indirect effects via days to 50% flowering (0.0014), plant height (0.5505) internodal length (0.0572), basal stem diameter (0.0527), fibre-wood ratio (0.0005) and fibre yield/plant (0.6132). Its correlation with fibre yield/plot was positive and significant (0.5140).

At the phenotypic level this trait exhibited positive direct effect (0.0083) and positive indirect effects via days to 50% flowering (0.0015), internodal length (0.0366), basal stem diameter (0.0228), fibre-wood ratio (0.0012), fibre length (0.1386) and fibre yield / plant (0.5786). It also showed negative indirect effects via plant height (-0.0411) and number of inter nodes (-0.2459). Its correlation with fibre yield / plot was significant and positive (0.5006) at phenotypic level.

4.3.7 Fibre-wood ratio

At the genotypic this trait exhibited negative direct effect (-0.0259) and negative indirect effects via plant height (-0.3611), internodal length (-0.0532), basal stem diameter (-0.0206) and fibre yield/plant (-0.2207). It also exhibited positive indirect effect via days to 50% flowering (0.0011), number of internodes (0.0976), bark thickness (0.0002) and fibre length (0.2965). Its correlation with fibre yield/plot was significant negative (-0.2861).

At the phenotypic level, this trait exhibited negative direct effect (-0.0618) and negative indirect effect via internodal length (-0.0342), basal stem diameter (-0.0090), bark thickness (-0.0002), fibre length (-0.0839) and fibre yield/plant (-0.2092). It also exhibited positive indirect effect via days to 50% flowering (0.0013), plant height (0.0268) and number of internodes (0.0920). Its correlation with fibre yield / plot was significant and negative (-0.2781) at phenotypic level.

4.3.8 Fibre length

This trait showed the negative direct effect (-0.7805) and negative indirect effects via days to 50% flowering (-0.0010), number of internodes (-0.4357) and bark thickness (-0.0057). It also showed positive indirect effects via plant height (0.8862), internodal length (0.1081), basal stem diameter (0.0595), fibre-wood ratio (0.0098) and fibre yield/plant (0.9283). Its correlation with fibre yield/plot was significant positive (0.7691) at the genotypic level.

At phenotypic level this trait showed the positive direct effect (0.2306) and positive indirect effects via internodal length (0.0666), basal stem diameter (0.0251), bark thickness (0.0050), fibre-wood ratio (0.0225) and fibre yield / plant (0.8598). It also showed negative indirect effects days to 50% flowering (-0.0009), plant height (-0.0675) and number of internodes (-0.4023). Its correlation with fibre yield / plot was significant and positive (0.7389) at phenotypic level.

4.3.9 Fibre yield / plant

At the genotypic level this trait showed the positive direct effect (1.1954) and positive indirect effects via plant height (0.6772), internodal length (0.0830), basal stem diameter (0.0437) and fibre-wood ratio (0.0048). It showed negative indirect effects via days to 50% flowering (-0.0025), number of internodes (-0.4380), bark thickness (-0.0047) and fibre length (-0.6061). Its correlation with fibre yield/plot was significant positive (0.9529).

This trait showed positive direct effect (1.1407) and also showed positive indirect effects via internodal length (0.0532), basal stem diameter (0.0191), bark thickness (0.0042), fibre-wood ratio (0.0113) and fibre length (0.1738). It also showed negative indirect effects via days to 50% flowering (-0.0028), plant height (-0.0508) and number of internodes (-0.4134). Its correlation with fibre yield / plot was significant and positive (0.9353) at phenotypic level.

4.4 DISCRIMINANT FUNCTION AND SELECTION INDICES

Results of selection indices constructed using Fisher's discriminant function in *Hibiscus sabdariffa* L. genotypes are described below.

CLASSICAL SELECTION INDICES

The economic weights (a_i values) given for each character are embodied in the Table 10.

Table 10. Economic weights (a_i) for different characters in roselle hemp (*Hibiscus sabdariffa* L.) genotypes for classical selection indices

Characters	Weights (a_i)
1. Days to 50% flowering	0.0093
2. Plant height	0.0079
3. Number of internodes	0.0364
4. Internodal length	0.2526
5. Basal stem diameter	0.5595
6. Bark thickness	3.4317
7. Fibre – wood ratio	2.6910
8. Fibre length	0.0090
9. Fibre yield / plant	0.1485
10. Fibre yield / plot	0.0012

Inverse of mean value of respective character was considered as allotted weight. This reduced the wide disparity observed between characters. Bark thickness got high weightage value ($a_i = 3.4317$) followed by fibre – wood ratio ($a_i = 2.6910$).

The weighing coefficients (b_i) values for 10 characters in *Hibiscus sabdariffa* L. are embodied in the Table 11.

Table 11. Weighing coefficients (b_i) for different characters in roselle hemp (*Hibiscus sabdariffa* L.) for classical selection indices

S.No.	Characters	b_i values
1.	Days to 50% flowering	0.0088
2.	Plant height	0.0106
3.	Number of internodes	0.0190
4.	Internodal length	0.1507
5.	Basal stem diameter	0.5952
6.	Bark thickness	3.4615
7.	Fibre – wood ratio	2.4851
8.	Fibre length	0.0027
9.	Fibre yield / plant	0.2451
10.	Fibre yield / plot	0.0004

Highest b_i value was observed for bark thickness ($b_i = 3.4615$) followed by fibre – wood ratio ($b_i = 2.4851$).

Table 12. Selection criterion values for 50 genotypes of roselle hemp (*Hibiscus sabdariffa* L.)

S.No.	Genotype	Selection criterion
1.	AR-34	9.919
2.	8409-8408/68	8.590
3.	AS-81-12	9.390
4.	R-174	7.274
5.	R-11	8.631

S.No.	Genotype	Selection criterion
6.	AR-118	8.655
7.	AR-40	7.841
8.	R-51	7.388
9.	R-35	8.989
10.	AR-82	9.865
11.	8404-8408/68	9.142
12.	AR-72	7.862
13.	8444-8448/68	7.759
14.	R-237	8.812
15.	R-283	7.507
16.	AR-10	9.387
17.	R-319	6.748
18.	AR-54	8.464
19.	R-286	7.201
20.	R-292	7.467
21.	AR-127	9.816
22.	8459-8463/68	9.859
23.	AS-81-11	7.822
24.	R-258	7.893
25.	8434-8438/68	7.890
26.	AR-90	9.410
27.	R-129	8.628
28.	AR-68	7.525

S.No.	Genotype	Selection criterion
29.	R-86	11.393
30.	R-45	7.855
31.	6283-4044	12.370
32.	AS-80-23	8.517
33.	AR-51	7.789
34.	R-342	8.165
35.	AS-81-18	10.981
36.	R-28	8.077
37.	AMV-4 (AMV-1 x AS-163)	8.629
38.	RT-768	7.893
39.	ER-51 A	7.608
40.	ER-51	8.437
41.	ER-26	9.031
42.	ER-63	7.875
43.	ER-33	7.448
44.	ER-57	7.966
45.	ER-58	9.536
46.	ER-44	9.442
47.	ER-35 A	13.336
48.	ER-65	7.513
49.	ER-56	9.451
50.	ER-7	9.212

Selection criteria for 50 genotypes of *Hibiscus sabdariffa* L. are given in the Table 12. High value of selection criteria was observed for the genotypes. ER-35A (13.336) followed by 6283-4044 (12.370), R-86 (11.393), AS-81-18 (10.981), AR-34 (9.919), while the lowest was observed for the genotype R-319 (6.748).

Discriminate functions with index of genetic advance as well as relative efficiency over fibre yield per plot was computed for the ten economic characters viz., days to 50% flowering, plant height, number of internodes, internodal length, basal stem diameter, bark thickness, fibre-wood ratio, fibre length, fibre yield per plant and fibre yield per plot.

The inclusion of characters one by one in the function resulted in the increased efficiency of selection. The character fibre yield per plant showed a genetic advance of 2.67, with the characters viz., days to 50% flowering, plant height, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot. High genetic advance of 2.84 was exhibited with the characters viz., plant height, number of internodes, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot.

The function which includes the eight characters i.e., days to 50% flowering, plant height, number of internodes, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot, gave the highest genetic advance (2.85) and the highest relative efficiency of 504.25% over fibre yield per plot. This was followed by the characters like plant height, number of internodes, basal stem diameter, bark thickness,

fibre length, fibre yield per plant and fibre yield per plot with a genetic advance of 2.84 and relative efficiency of 502.90% over fibre yield per plot.

RESTRICTED SELECTION INDICES

Restricted selection indices using single case restriction of days to 50% flowering, plant height, number of internodes, internodal length, basal stem diameter, bark thickness, fibre-wood ratio, fibre length, fibre yield / plant and fibre yield / plot were constructed.

The characterwise weighing coefficients (b_i) values and genetic advance (ΔG_i) for *Hibiscus sabdariffa* L. are embodied in Tables 13 and 14.

1. Days to 50% flowering

By restricting days to 50% flowering, positive weighing coefficient values were observed for plant height (2.1561), number of internodes (4.0120), basal stem diameter (5.6158), bark thickness (8.1624), fibre-wood ratio (0.3080) and fibre yield/plant (23.5478). Highest value of genetic advance was observed for fibre yield / plot (216.5357) and low value for fibre wood ratio (-0.0274).

2. Plant height

By restricting plant height, positive weighing coefficient values were observed for days to 50% flowering (0.6115), internodal length (3.9466), fibre-wood ratio (56.5477), fibre length (0.3574), fibre yield / plant (10.4883) and fibre yield / plot (0.8925). Highest value of genetic advance was

observed for fibre yield / plot (138.4791) and lowest value for basal stem diameter (-0.0215).

3. Number of internodes

By restricting number of internodes positive weighing coefficient values were observed for days to 50% flowering (1.4272) internodal length (19.1059), bark thickness (44.2923) fibre length (2.2440), fibre yield / plant (5.1019) and fibre yield / plot (0.9188). Highest value of genetic advance was observed for fibre yield / plot (135.2761) and lowest value for basal stem diameter (-0.0052).

4. Internodal length

By restricting internodal length, positive weighing coefficient values were observed for days to 50% flowering (1.1186), plant height (3.6868), internodal length (225.4571), basal stem diameter (21.0736), bark thickness (15.5968), fibre – wood ratio (40.8889), fibre yield / plant (7.2003) and fibre yield / plot (0.9411). Highest value of genetic advance was observed for fibre yield/plot(169.6610) and lowest value for fibre –wood ratio(-0.0053)

5. Basal stem diameter

By restricting basal stem diameter, positive weighing coefficient values were observed for days to 50% flowering (1.4080) plant height (1.9054), number of internodes (1.0487), fibre–wood ratio(18.7087), fibre yield/plot(32.1549) and fibre yield / plot (0.7491). Highest value of genetic advance was observed for fibre yield / plot (166.9672) and lowest value for fibre-wood ratio(-0.0114).

6. Bark thickness

By restricting bark thickness, positive weighing coefficient values were observed for days to 50% flowering (1.1323), plant height (3.7413), number of internodes (4.1264), fibre yield / plant (37.2464) and fibre yield / plot (0.6949). Highest value of genetic advance was observed for fibre yield per plot (186.0016) and lowest value for fibre-wood ratio (-0.0319).

7. Fibre – wood ratio

By restricting fibre – wood ratio, positive weighing coefficient values were observed for days to 50% flowering (1.0951), plant height (1.8928), number of internodes (3.9093), basal stem diameter (5.6362), bark thickness (10.6586), fibre-wood ratio (755.3062), fibre yield / plant (25.7596) and fibre yield / plot (0.7951). Highest value of genetic advance was observed for fibre yield / plot (209.9876) and lowest value for internodal length (-0.3307).

8. Fibre length

By restricting fibre length, positive weighing coefficient values were observed for days to 50% flowering (0.5275), internodal length (11.8269), fibre length (1.5455) and fibre yield/plot (1.0050). Highest value of genetic advance was observed for fibre yield / plot (136.6558) and lowest value for internodal length (-0.0168).

9. Fibre yield / plant

By restricting fibre yield / plant, positive weighing coefficient values were observed for days to 50% flowering (1.1446), plant height (1.7178), number of internodes (2.9116), internodal length (0.0516), basal stem diameter (9.3120) and fibre yield / plot (0.2957). Highest value of genetic

advance was observed for plant height (9.8402) and lowest value for fibre-wood ratio (-0.0338).

10. Fibre yield / plot

By restricting fibre yield / plot, positive weighing coefficients were observed for days to 50% flowering (1.0577), plant height (1.6009), number of internodes (3.0063), basal stem diameter (6.5102), bark thickness (4.2245), and fibre yield / plant (1.7420). Highest value of genetic advance value was observed for plant height (10.2826) and lowest value for fibre-wood ratio (-0.0286).

4.3 PATH COEFFICIENT ANALYSIS

The correlation coefficients do not project the complete picture specially when the caused factors are interrelated. The correlation coefficients between fibre yield / plot and each of its component characters was partitioned into the corresponding direct and indirect effects through path coefficient analysis. The path coefficients of different attributes on fibre yield / plot based on the phenotypic and genotypic correlation in *Hibiscus sabdariffa* (L). are embodied in table 8 and table 9.

4.3.1 Days to 50% flowering

This trait had negative direct effect (-0.0252) on fibre yield / plot and negative indirect effects via plant height (-0.0024), number of internodes (-0.0153), basal stem diameter (-0.0025), bark thickness (-0.0005). This trait had positive indirect effects via internodal length (0.0054) fibre – wood ratio (0.0031), fibre length (0.0085) and fibre yield / plant (0.124). Its correlation with fibre yield / plot was positive and non-significant (0.0955) at phenotypical level.

4.3.2 Plant height

This trait showed negative direct effect (-0.0681) and had negative indirect effects via days to 50% flowering (-0.0009) and number of internodes (-0.3692) and positive effect via internodal length (0.0659), basal stem diameter (0.0253), bark thickness (0.0050), fibre-wood ratio (0.0243), fibre length (0.2286) and fibre yield / plant (0.8519) at phenotypic level. Its

correlation with fibre yield / plot was significant and positive (0.7359) at phenotypical level.

4.3.3 Number of internodes

This trait exhibited negative direct effect (-0.4969) and negative indirect effects via days to 50% flowering (-0.0008) and plant height (-0.0543). This trait also exhibited positive indirect effect via internodal length (0.0585), basal stem diameter (0.0210), bark thickness (0.0041), fibre – wood ratio (0.0114), fibre length (0.1867) and fibre yield / plant (0.9490) at phenotypic level. Its correlation with fibre yield / plot was significant and positive (0.6787) at phenotypical level.

4.3.4 Internodal length

At phenotypic level this trait showed negative direct effect (-0.0997) and had negative indirect effect via basal stem diameter (-0.0157), bark thickness (0.0030), fibre – wood ratio (-0.0212), fibre length (-0.1540) and fibre yield / plant (-0.6087). This trait had positive indirect effects via days to 50% flowering (0.0014), plant height (0.0450) and number of internodes (0.2915) and its correlation with fibre yield / plot was significant and negative (-0.5644) at phenotypical level.

4.3.5 Basal stem diameter

At the phenotypic level this trait showed positive direct effect (0.0314) and positive indirect effects via days to 50% flowering (0.0020), internodal length (0.0498), bark thickness (0.0060), fibre-wood ratio (0.0176), fibre length (0.1843) and fibre yield / plant (0.6920) and exhibited negative indirects via plant height (-0.0548) and number of internodes (-0.3315). Its correlation

with fibre yield / plot was significant and positive (0.5968) at phenotypical level.

4.3.6 Bark thickness

At the phenotypic level this trait exhibited positive direct effect (0.0083) and positive indirect effects via days to 50% flowering (0.0015), internodal length (0.0366), basal stem diameter (0.0228), fibre-wood ratio (0.0012), fibre length (0.1386) and fibre yield / plant (0.5786). It also showed negative indirect effects via plant height (-0.0411) and number of inter nodes (-0.2459). Its correlation with fibre yield / plot was significant and positive (0.5006) at phenotypical level.

4.3.7 Fibre-wood ratio

At the phenotypic this trait exhibited negative direct effect (-0.0618) and negative indirect effect via internodal length (-0.0342), basal stem diameter (-0.0090), bark thickness (-0.0002), fibre length (-0.0839) and fibre yield/plant. It also exhibited positive indirect effect via days to 50% flowering (0.0013), plant height (0.0268) and number of internodes (0.0920). Its correlation with fibre yield / plot was significant and negative (-0.2781) at phenotypical level.

4.3.8 Fibre length

At phenotypic level this trait showed the positive direct effect (0.2306) and positive indirect effects via internodal length (0.0666), basal stem diameter (0.0251), bark thickness (0.0050), fibre-wood ratio (0.0225) and fibre yield / plant (0.8598). It also showed negative indirect effects days to 50% flowering (-0.0009), plant height (-0.0675) and number of internodes

(-0.4023). Its correlation with fibre yield / plot was significant and positive (0.7389) at phenotypic level.

4.3.9 Fibre yield / plant

This trait showed positive direct effect (1.1407) and also showed positive indirect effects via internodal length (0.0532), basal stem diameter (0.0191), bark thickness (0.0042), fibre-wood ratio (0.0113) and fibre length (0.1738). It also showed negative indirect effects via days to 50% flowering (-0.0028), plant height (-0.0508) and number of internodes (-0.4134). Its correlation with fibre yield / plot was significant and positive (0.9353) at phenotypic level.

4.4 DISCRIMINANT FUNCTION AND SELECTION INDICES

Results of selection indices constructed using Fisher's discriminant function in *Hibiscus sabdariffa* L. genotypes are described below.

CLASSICAL SELECTION INDICES:

The economic weights (a_i values) given for each character are embodied in the Table 10.

Table:10 Economic weights (a_i) for different characters in *Hibiscus sabdariffa* L. genotypes.

Characters	Weights (a_i)
1. Days to 50% flowering	0.0093
2. Plant height	0.0079
3. Number of internodes	0.0364
4. Internodal length	0.2526

Characters	Weights (a_i)
5. Basal stem diameter	0.5595
6. Bark thickness	3.4317
7. Fibre – wood ratio	2.6910
8. Fibre length	0.0090
9. Fibre yield / plant	0.1485
10. Fibre yield / plot	0.0012

Inverse of mean value of respective character was considered as allotted weight. This reduced the wide disparity observed between characters. Bark thickness got high weightage value ($a_i = 3.4317$) followed by fibre – wood ratio ($a_i = 2.6910$).

The weighing coefficients (b_i) values for 10 characters in *Hibiscus sabdariffa* L. are embodied in the Table 11.

Table 11. Weighing coefficients (b_i) for different characters in *Hibiscus sabdariffa* L. in classical selection indices.

S.No.	Characters	b_i values
1.	Days to 50% flowering	0.0088
2.	Plant height	0.0106
3.	Number of internodes	0.0190
4.	Internodal length	0.1507
5.	Basal stem diameter	0.5952
6.	Bark thickness	3.4615
7.	Fibre – wood ratio	2.4851
8.	Fibre length	0.0027
9.	Fibre yield / plant	0.2451
10.	Fibre yield / plot	0.0004

Highest b_i value was observed for bark thickness ($b_i = 3.4615$) followed by fibre – wood ratio ($b_i = 2.485$).

Table:12 Selection criterion values for 50 genotypes of roselle (*Hibiscus sabdariffa* L.).

S.No.	Genotype	Selection criterion
1.	AR-34	9.919
2.	8409-8408/68	8.590
3.	AS-81-12	9.390
4.	R-174	7.274
5.	R-11	8.631
6.	AR-118	8.655
7.	AR-40	7.841
8.	R-51	7.388
9.	R-35	8.989
10.	AR-82	9.865
11.	8404-8408/68	9.142
12.	AR-72	7.862
13.	8444-8448/68	7.759
14.	R-237	8.812
15.	R-283	7.507
16.	AR-10	9.387
17.	R-319	6.748
18.	AR-54	8.464
19.	R-286	7.201

S.No.	Genotype	Selection criterion
20.	R-292	7.467
21.	AR-127	9.816
22.	8459-8463/68	9.859
23.	AS-81-11	7.822
24.	R-258	7.893
25.	8434-8438/68	7.890
26.	AR-90	9.410
27.	R-129	8.628
28.	AR-68	7.525
29.	R-86	11.393
30.	R-45	7.855
31.	6283-4044	12.370
32.	AS-80-23	8.517
33.	AR-51	7.789
34.	R-342	8.165
35.	AS-81-18	10.981
36.	R-28	8.077
37.	AMV-4 (AMV-1 x AS-163)	8.629
38.	RT-768	7.893
39.	ER-51 A	7.608
40.	ER-51	8.437
41.	ER-26	9.031
42.	ER-63	7.875

S.No.	Genotype	Selection criterion
43.	ER-33	7.448
44.	ER-57	7.966
45.	ER-58	9.536
46.	ER-44	9.442
47.	ER-35 A	13.336
48.	ER-65	7.513
49.	ER-56	9.451
50.	ER-7	9.212

Selection criteria for 50 genotypes of *Hibiscus sabdariffa* L. are given in the Table 12. High value of selection criteria was observed for the genotypes. ER-35A (13.336) followed by 6283-4044 (12.370), R-86 (11.393), AS-81-18 (10.981), AR-34 (9.919), while the lowest was observed for the genotype R-319 (6.748).

Discriminate functions with index of genetic advance as well as relative efficiency over fibre yield per plot was computed for the ten economic characters viz., days to 50% flowering, plant height, number of internodes, internodal length, basal stem diameter, bark thickness, fibre-wood ratio, fibre length, fibre yield per plant and fibre yield per plot.

The inclusion of characters one by one in the function resulted in the increased efficiency of selection. The character fibre yield per plant showed a genetic advance of 2.67, with the characters viz., days to 50% flowering, plant height, basal stem diameter, bark thickness, fibre length, fibre yield per plant

and fibre yield per plot. High genetic advance 2.84 was exhibited and with the characters viz., plant height, number of internodes, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot.

The function which includes the eight characters i.e., days to 50% flowering, plant height, number of internodes, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot, gave the highest genetic advance (2.85) and the highest relative efficiency of 504.25% over fibre yield per plot. This has followed by the characters like plant height, number of internodes, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot with a genetic advance of 2.84 and relative efficiency of 502.90% over fibre yield per plot.

RESTRICTED SELECTION INDICES

Restricted selection indices using single case restriction of days to 50% flowering, plant height, number of internodes, internodal length, basal stem diameter, bark thickness, fibre-wood ratio, fibre length, fibre yield / plant and fibre yield / plot.

The characterwise weighing coefficients (b_i) values and genetic advance (ΔG_i) for *Hibiscus sabdariffa* L. are embodied in Tables 13 and Table 14.

1. Days to 50% flowering:

By restricting days to 50% flowering, positive weighing coefficient values were observed for plant height (2.1561), number of internodes (4.0120), basal stem diameter (5.6158), bark thickness (8.1624), fibre-wood

ratio (0.3080) and fibre yield/plant (23.5478). Highest value of genetic advance was observed for fibre yield / plot (216.5357) and low value for fibre wood ratio (-0.0274).

2. Plant height:

By restricting plant height positive weighing coefficient values were observed for days to 50% flowering (0.6115), internodal length (3.9466), fibre-wood ratio (56.5477), fibre length (0.3574), fibre yield / plant (10.4883) and fibre yield / plot (0.8925). Highest value of genetic advance was observed for fibre yield / plot (138.4791) and low value for basal stem diameter (-0.0215).

3. Number of internodes:

By restricting number of internodes positive weighing coefficient values were observed for days to 50% flowering (1.4273) internodal length (19.1059), bark thickness (44.2923) fibre length (2.2440), fibre yield / plant (5.1019) and fibre yield / plot (0.9188). Highest value of genetic advance was observed for fibre yield / plot (135.2761) and low value for basal stem diameter (-0.0052).

4. Internodal length:

By restricting internodal length positive weighing coefficient values were observed for days to 50% flowering (1.1186), plant height (3.6868), internodal length (225.4571), basal stem diameter (21.0736), bark thickness (15.5968), fibre – wood ratio (40.8889), fibre yield / plant (7.2003) and fibre yield / plot (0.9411). Highest value of genetic advance was observed for fibre yield/plot(169.6610) and lowest value for fibre –wood ratio(-0.0053)

5. Basal stem diameter:

By restricting basal stem diameter positive weighing coefficient values were observed for days to 50% flowering(1.4080) plant height (1.9054), number of internodes (1.0487), fibre –wood ratio(18.7087), fibre yield/plant(32.1549) and fibre yield / plot (0.7491). Highest value of genetic advance was observed for fibre yield / plot (166.9672) and lowest value for fibre-wood ratio(-0.0114)

6. Bark thickness:

By restricting bark thickness positive weighing coefficient values were observed days to 50% flowering (1.1323),plant height(3.7413),number of internodes(4.1264), fibre yield / plant (37.2464) and fibre yield / plot (0.6949) Highest value of genetic advance was observed for fibre yield per plot (186.0016) and lowest value for fibre-wood ratio(-0.0319).

7. Fibre – wood ratio:

By restricting fibre – wood ratio positive weighing coefficient values were observed for days to 50% flowering (1.0951), plant height (1.8928), number of internodes (3.9093), basal stem diameter (5.6362), bark thickness (10.6586), fibre-wood ratio (755.3062), fibre yield / plant (25.7596) and fibre yield / plot (0.7951). Highest value of genetic advance was observed for fibre yield / plot (209.9876) and lowest value for internodal length (-0.3307).

8. Fibre length:

By restricting fibre length positive weighing coefficient values were observed for days to 50% flowering (0.5275), internodal length (11.8269), fibre length (1.5455) and fibre yield/plot (1.0050). Highest value of genetic advance was observed for fibre yield / plot (136.6558) and lowest value for internodal length (-0.0168).

9. Fibre yield / plant:

By restricting fibre yield / plant positive weighing coefficient values were observed for days to 50% flowering (1.1446), plant height (1.7178), number of internodes (2.9116), internodal length (0.0516), basal stem diameter (9.3120) and fibre yield / plot (0.2957). Highest value of genetic advance was observed for plant height (9.8402) and lowest value for fibre-wood ratio (-0.0338).

10. Fibre yield / plot:

By restricting fibre yield / plot positive weighing coefficients were observed for days to 50% flowering (1.0577), plant height (1.6009), number of internodes (3.0063), basal stem diameter (6.5102), bark thickness (4.2245), and fibre yield / plant (1.7420). Highest value of genetic advance value was observed for plant height (10.2826) and lowest value for fibre-wood ratio (-0.0286).

Table 3 Mean performance of 10 characters in 50 genotypes of roselle hemp (*Hibiscus sabdariffa* L.)

S.No.	Genotype	Days to 50% flowering	Plant height (cm)	No of internodes	Internodal length (cm)	Basal stem diameter (cm)	Bark thickness (cm)	Fibre-wood ratio	Fibre length (cm)	Fibre yield / plant (g)	Fibre yield / plot (g)
1	AR-34	105.25	146.77	31.55	2.57	2.32	0.37	0.34	130.32	8.55	1026.00
2	8409-8408/68	112.25	119.47	24.47	4.55	1.82	0.24	0.55	103.30	5.55	523.50
3	AS-81-12	97.75	114.75	24.40	4.60	1.47	0.62	0.52	98.52	5.27	633.00
4	R-174	103.25	87.55	23.47	4.92	1.45	0.20	0.53	73.85	3.92	471.00
5	R-11	92.50	140.35	30.40	3.27	1.95	0.26	0.50	125.12	5.37	645.00
6	AR-118	113.00	126.82	28.07	3.40	1.80	0.24	0.29	109.40	7.85	942.00
7	AR-40	104.50	119.47	26.62	3.12	1.45	0.17	0.28	103.07	7.57	909.00
8	R-51	107.25	111.10	24.62	4.37	1.27	0.18	0.39	96.52	5.05	606.00
9	R-35	104.50	127.77	26.60	4.07	1.80	0.34	0.34	110.37	7.35	882.00
10	AR-82	92.00	144.22	30.35	3.17	2.42	0.44	0.26	127.85	8.40	1008.00
11	8404-8408/68	113.50	129.87	27.72	4.07	1.92	0.27	0.47	112.77	6.95	834.00
12	AR-72	100.75	120.67	25.80	3.85	1.70	0.18	0.31	104.22	6.50	780.00
13	8444-8448/68	113.75	114.87	24.65	4.60	1.50	0.19	0.43	100.05	4.95	594.00
14	R-237	88.25	132.17	29.85	4.60	2.12	0.27	0.29	115.10	7.17	861.00
15	R-283	118.00	119.75	26.77	3.40	1.40	0.18	0.33	102.95	5.37	645.00
16	AR-10	113.25	148.57	30.92	3.80	1.40	0.16	0.33	131.80	10.35	1233.00
17	R-319	109.25	97.05	24.25	3.42	0.82	0.16	0.42	84.42	4.90	588.00
18	AR-54	117.00	129.55	27.20	3.85	1.70	0.23	0.31	112.35	6.92	831.00
19	R-286	107.25	102.77	25.50	3.85	1.27	0.18	0.43	89.90	4.67	561.00
20	R-292	110.50	103.45	24.75	4.30	1.30	0.15	0.52	91.45	4.72	567.00
21	AR-127	97.00	142.90	29.40	3.42	2.37	0.38	0.29	126.37	8.60	1032.00
22	8459-8463/68	113.25	137.45	28.80	3.60	2.37	0.42	0.25	121.80	8.25	990.00
23	AS-81-11	109.00	100.45	24.20	4.92	1.15	0.20	0.41	87.65	6.50	780.00
24	R-258	109.50	123.95	25.35	4.50	1.75	0.24	0.25	106.82	5.52	663.00
25	8434-8438/68	102.75	126.92	26.80	4.00	1.87	0.26	0.26	110.27	5.17	636.00
26	AR-90	95.75	134.75	28.52	3.47	2.07	0.34	0.46	117.97	7.37	885.00
27	R-129	111.25	130.07	27.72	3.75	1.87	0.31	0.24	112.42	6.90	828.00
28	AR-68	92.00	84.62	21.97	5.25	1.47	0.21	0.56	71.10	4.72	567.00
29	R-86	109.25	152.32	30.60	3.47	2.40	0.53	0.41	134.62	10.22	1236.00
30	R-45	113.00	127.20	25.67	4.17	1.75	0.22	0.28	109.47	5.30	636.00
31	6283-4044	120.25	155.22	31.75	3.20	2.65	0.64	0.52	139.47	10.42	1251.00
32	AS-80-23	102.00	146.85	29.57	3.47	2.32	0.36	0.32	129.72	3.92	471.00
33	AR-51	113.75	114.12	24.70	4.22	1.45	0.28	0.39	99.02	4.62	555.00
34	R-342	119.00	118.02	26.70	3.80	1.55	0.24	0.35	102.80	6.27	753.00
35	AS-81-18	116.75	151.40	30.30	3.45	2.45	0.58	0.25	133.87	9.40	1128.00
36	R-28	100.50	127.80	26.77	3.90	1.47	0.21	0.39	110.95	6.17	741.00
37	AMV-4 (AMV-1 x AS-163)	109.25	131.60	28.00	3.72	1.82	0.25	0.30	114.60	7.25	870.00
38	RT-768	96.75	117.00	25.02	4.10	1.55	0.18	0.37	101.25	6.57	789.00
39	ER-51A	100.50	113.00	24.47	4.57	1.40	0.21	0.48	98.60	4.50	507.00
40	ER-51	116.50	131.67	27.45	4.27	1.65	0.21	0.31	114.05	6.80	849.00
41	ER-26	111.75	138.22	29.27	3.52	1.92	0.17	0.25	122.95	9.30	1149.00
42	ER-63	103.50	122.67	25.52	4.77	1.75	0.23	0.28	105.20	5.52	663.00
43	ER-33	97.25	123.90	26.57	4.52	1.77	0.25	0.24	106.22	4.22	507.00
44	ER-57	117.75	97.20	22.55	5.52	1.52	0.22	0.49	82.05	5.10	612.00
45	ER-58	93.50	137.25	28.27	3.70	2.05	0.31	0.38	122.27	8.67	1041.00
46	ER-44	86.75	131.45	27.20	3.87	1.80	0.45	0.37	114.50	7.70	924.00
47	ER-35A	110.75	170.92	49.32	3.22	2.55	0.49	0.43	154.45	15.67	1302.00
48	ER-65	114.25	113.62	22.15	4.50	1.20	0.17	0.43	98.00	5.25	630.00
49	ER-56	112.00	141.85	30.40	3.32	2.30	0.46	0.23	125.75	6.70	804.00
50	ER-7	110.75	137.87	27.67	3.77	2.12	0.36	0.35	122.62	6.60	774.00
Mean		106.60	126.38	27.41	3.95	1.78	0.29	0.37	110.40	6.73	794.25
C.V.		0.97	2.83	1.91	5.06	4.80	5.86	3.04	3.61	1.56	5.45
F ratio		275.87	96.83	236.90	36.70	92.63	216.20	287.97	70.79	1661.20	105.82
S.E.		0.51	1.79	0.26	0.10	0.04	0.00	0.00	1.99	0.05	21.65
C.D. 5%		1.45	5.01	0.73	0.28	0.12	0.02	0.01	5.57	0.14	60.53

C.V. = Co efficient of variation

S.E. = Standard error

C.D. = Critical difference

Table 5. Variability, heritability and genetic advance for yield and yield components of 50 roselle genotypes during kharif 2005

S.No.	Character	PCV (%)	GCV (%)	h^2 (%)	GAM
1.	Days to 50% flowering	8.14	8.08	98.6	16.53
2.	Plant height	14.18	13.89	96.0	28.04
3.	No. of internodes per plant	14.79	14.67	98.3	29.96
4.	Internodal length	15.95	15.12	89.9	29.55
5.	Basal stem diameter	23.49	23.00	95.8	46.37
6.	Bark thickness	43.39	43.00	98.2	87.76
7.	Fibre wood ratio	25.95	25.77	98.6	52.72
8.	Fibre length	15.51	15.09	94.6	30.23
9.	Fibre yield / plant	31.90	31.86	99.8	65.55
10.	Fibre yield / plot	28.44	27.92	96.3	56.44

PCV : Phenotypic Coefficient of Variation
GCV : Genotypic Coefficient of Variation
 h^2 : Heritability in broad sense
GAM : Genetic Advance as percent of Mean

Table 4. Alalysis of variance for ten characters in 50 genotypes of roselle hemp (*Hibiscus sabdariffa* L.) (Mean sum of squares)

Source	d.f	Days to 50% flowering	Plant height	No. of inter-nodes	Inter nodal length	Basal stem diameter	Bark thickness	Fibre-wood ratio	Fibre length	Fibre Yield/ plant	Fibre Yield/ Plot
Blocks	3	0.18	10.52	0.03	0.005	0.010	0.0001	0.0002**	7.320	0.0010	100.232
Treatments	49	298.2448**	1246.8922**	64.9689**	1.4738**	0.6830**	0.0631**	0.0368**	1126.5594**	18.4241**	198575.3571**
Error	147	1.0810	12.8768	0.2742	0.0401	0.0073	0.0002	0.0001	15.9124	0.0110	1876.5228

** Significant at 1% level

d.f Degrees of freedom

Table 5. Variability, heritability and genetic advance for yield and yield components of 50 roselle genotypes during kharif 2005

S.No.	Character	PCV (%)	GCV (%)	h^2 (%)	GAM
1.	Days to 50% flowering	8.14	8.08	98.6	16.53
2.	Plant height	14.18	13.89	96.0	28.04
3.	No. of internodes per plant	14.79	14.67	98.3	29.96
4.	Internodal length	15.95	15.12	89.9	29.55
5.	Basal stem diameter	23.49	23.00	95.8	46.37
6.	Bark thickness	43.39	43.00	98.2	87.76
7.	Fibre wood ratio	25.95	25.77	98.6	52.72
8.	Fibre length	15.51	15.09	94.6	30.23
9.	Fibre yield / plant	31.90	31.86	99.8	65.55
10.	Fibre yield / plot	28.44	27.92	96.3	56.44

PCV : Phenotypic Coefficient of Variation
GCV : Genotypic Coefficient of Variation
 h^2 : Heritability in broad sense
GAM : Genetic Advance as percent of Mean

Table 6. Genotypic correlation coefficients of yield components in 50 genotypes of roselle hemp (*Hibiscus sabdariffa* L.).

Characters	Plant height	No. of inter-nodes	Internodal length	Basal stem diameter	Bark thickness	Fibre-wood ratio	Fibre length	Fibre yield/plant	Fibre yield / plot
Days to 50% flowering	0.0414	0.0303	-0.0503	-0.0847	-0.0605	-0.0504	0.0431	0.1099	0.0995
Plant height		0.8221**	-0.7197**	0.8428**	0.6212**	-0.4075**	0.9999**	0.7641**	0.7602**
No. of internodes			-0.6195**	0.6872**	0.5057**	-0.1872*	0.8360**	0.8404**	0.6988**
Internodal length				-0.5418**	-0.3885**	0.3613**	-0.7347**	-0.5637**	-0.6056**
Basal stem diameter					0.7479**	-0.2920**	0.8435**	0.6206**	0.6523**
Bark thickness						-0.0206	0.6264**	0.5129**	0.5140**
Fibre-wood ratio							-0.3799**	-0.1846*	-0.2861**
Fibre length								0.7766**	0.7691**
Fibre yield/plant									0.9529**

** Significant at 1% level

* Significant at 5% level

Table 7 . Phenotypic correlation coefficients of yield components in 50 genotypes of roselle hemp (*Hibiscus sabdariffa* L.).

Characters	Plant height	No. of internodes	Internodal length	Basal stem diameter	Bark thickness	Fibre-wood ratio	Fibre length	Fibre yield plant	Fibre yield / plot
Days to 50% flowering	0.0356	0.0307	-0.0538	-0.0791	-0.0588	-0.0499	0.0367	0.1092	0.0955
Plant height		0.7973**	-0.6613**	0.8058**	0.6040**	-0.3932**	0.9914**	0.7468**	0.7359**
No. of internodes			-0.5866**	0.6672**	0.4949**	-0.1852*	0.8096**	0.8319**	0.6787**
Internodal length				-0.4996**	-0.3675**	0.3428**	-0.6677**	-0.5336**	-0.5644**
Basal stem diameter					0.7262**	-0.2856**	0.7993**	0.6066**	0.5968**
Bark thickness						-0.0194	0.6012**	0.5072**	0.5006**
Fibre-wood ratio							-0.3639**	-0.1834*	-0.2781**
Fibre length								0.7538**	0.7389**
Fibre yield / plant									0.9353**

** Significant at 1% level

* Significant at 5% level

Table 8. Genotypic path coefficients of yield components in 50 genotypes of roselle hemp (*Hibiscus sabdariffa* L.)

Characters	Days to 50% flowering	Plant height	No.of internodes	Internodal length	Basal stem diameter	Bark thickness	Fibre wood ratio	Fibre length	Fibre yield/ plant
Days to 50% flowering	-0.0225	-0.0009	-0.0007	0.0011	0.0019	0.0014	0.0011	-0.0010	-0.0025
Plant height	0.0367	0.8863	0.7286	-0.6379	0.7469	0.5505	-0.3611	0.8862	0.6772
No. of internodes	-0.0158	-0.4284	-0.5212	0.3228	-0.3581	-0.2635	0.0976	-0.4357	-0.4380
Internodal length	0.0074	0.1059	0.0912	-0.1472	0.0797	0.0572	-0.0532	0.1081	0.0830
Basal stem diameter	-0.0060	0.0594	0.0484	-0.0382	0.0705	0.0527	-0.0206	0.0595	0.0437
Bark thickness	0.0005	-0.0056	-0.0046	0.0035	-0.0068	-0.0091	0.0002	-0.0057	-0.0047
Fibre-wood ratio	0.0013	0.0105	0.0048	-0.0093	0.0075	0.0005	-0.0259	0.0098	0.0048
Fibre length	-0.0336	-0.7804	-0.6524	0.5734	-0.6583	-0.4889	0.2965	-0.7805	-0.6061
Fibre yield/plant	0.1314	0.9134	1.0046	-0.6739	0.7419	0.6132	-0.2207	0.9283	1.1954
Fibre yield/plot (r(g)^l)	0.0995	0.7602**	0.6988**	-0.6056**	0.6253**	0.5140**	-0.2861**	0.7691**	0.9529**

R SQUARE = 0.9820

RESIDUAL EFFECT = 0.1341

Diagonal values in bold are direct effects.

(r(g)^l) = Genotypic correlation coefficient

** significant at 1% level.

Table 9. Phenotypic path coefficients of yield components in 50 genotypes of roselle hemp (*Hibiscus sabdariffa* L.)

Characters	Days to 50% flowering	Plant height	No.of internodes	Internodal length	Basal stem diameter	Bark thickness	Fibre wood ratio	Fibre length	Fibre yield/ plant
Days to 50% flowering	-0.0252	-0.0009	-0.0008	0.0014	0.0020	0.0015	0.0013	-0.0009	-0.0028
Plant height	-0.0024	-0.0681	-0.0543	0.0450	-0.0548	-0.0411	0.0268	-0.0675	-0.0508
No. of internodes	-0.0153	-0.3962	-0.4969	0.2915	-0.3315	-0.2459	0.0920	-0.4023	-0.4134
Internodal length	0.0054	0.0659	0.0585	-0.0997	0.0498	0.0366	-0.0342	0.0666	0.0532
Basal stem diameter	-0.0025	0.0253	0.0210	-0.0157	0.0314	0.0228	-0.0090	0.0251	0.0191
Bark thickness	-0.0005	0.0050	0.0041	-0.0030	0.0060	0.0083	-0.0002	0.0050	0.0042
Fibre-wood ratio	0.0031	0.0243	0.0114	-0.0212	0.0176	0.0012	-0.0618	0.0225	0.0113
Fibre length	0.0085	0.2286	0.1867	-0.1540	0.1843	0.1386	-0.0839	0.2306	0.1738
Fibre yield/ plant	0.1245	0.8519	0.9490	-0.6087	0.6920	0.5786	-0.2092	0.8598	1.1407
Fibre yield/plot (r(p))	0.0955	0.7359**	0.6787**	-0.5644**	0.5968**	0.5006**	-0.2781**	0.7389**	0.9353**

R SQUARE = 0.9439

RESIDUAL EFFECT = 0.2369

Diagonal values in bold are direct effects

(r(p)) = phenotypic correlation coefficient

** significant at 1% level.

Table 13 . Weighing coefficients (b_i) in case of restricted selection indices in roselle hemp (*Hibiscus sabdariffa* L.) genotypes

Characters	Days to 50% flowering	Plant height	No. of inter-nodes	Inter-nodal length	Basal stem diameter	Bark thickness	Fibre-wood ratio	Fibre length	Fibre yield/ plant	Fibre yield / plot
Days to 50% flowering	-2.8158	0.6115	1.4272	1.1186	1.4080	1.1323	1.0951	0.5275	1.1446	1.0577
Plant height	2.1561	-7.2999	-2.5906	3.6868	1.9054	3.7413	1.8928	-8.0962	1.7178	1.6009
Number of internodes	4.0120	-10.1509	-54.0474	-2.3341	1.0487	4.1264	3.9093	-12.5364	2.9116	3.0063
Internodal length	-1.0399	3.9466	19.1059	225.4571	-4.6778	-1.8995	-0.7100	11.8269	0.0516	-0.6364
Basal stem diameter	5.6158	-29.8059	-19.7791	21.0736	-345.6030	-4.3278	5.6362	-30.3210	9.3120	6.5102
Bark thickness	8.1624	-20.0005	44.2923	15.5968	-85.6217	-1053.3560	10.6586	-10.8593	-5.6608	4.2245
Fibre-wood ratio	0.3080	56.5477	-31.7284	40.8889	18.7087	-1.4383	755.3062	-26.4440	-9.8716	-1.3351
Fibre length	-0.8966	0.3574	2.2440	-3.4412	-1.4522	-2.5499	-0.6606	1.5444	-0.4073	-0.2363
Fibre yield/plant	23.5478	10.4883	5.1019	7.2003	32.1549	37.2464	25.7596	-4.1824	-50.6686	1.7420
Fibre yield / plot	0.8119	0.8925	0.9188	0.9411	0.7491	0.6949	0.7951	1.0050	0.2957	-0.1410

Table 14. Genetic advance (ΔG_i) values in case of single restricted selection indices in roselle hemp (*Hibiscus sabdariffa* L.) genotypes

Characters	Days to 50% flowering	Plant height	No. of internodes	Internodal length	Basal stem diameter	Bark thickness	Fibre-wood ratio	Fibre length	Fibre Yield/ plant	Fibre Yield/ Plot
Days to 50% flowering	0.0000	1.4949	2.2416	1.1851	2.3186	1.7313	1.0790	1.4989	2.8799	2.4542
Plant height	14.3276	0.0000	0.9070	7.3435	5.4475	9.9081	12.7413	-0.1653	9.8402	10.2826
Number of internodes	2.1985	0.1602	0.0000	0.9845	0.9102	1.5907	1.9728	0.1136	1.2739	1.3427
Inter nodal length	-0.3793	-0.0305	0.0212	0.0000	-0.2070	-0.3005	-0.3307	-0.0168	-0.2269	-0.2435
Basal stem diameter	0.2850	-0.0215	-0.0052	0.1624	0.0000	0.1295	0.2534	-0.0249	0.1984	0.2076
Bark thickness	0.0696	0.0050	0.0134	0.0457	0.0034	0.0000	0.0702	0.0035	0.0317	0.0397
Fibre-wood ratio	-0.0274	0.0089	0.0030	-0.0053	-0.0114	-0.0319	0.0000	0.0054	-0.0338	-0.0286
Fibre length	13.7193	0.1979	0.9042	6.9551	5.3355	9.4992	12.3618	0.0000	9.1831	9.6544
Fibre yield/plant	1.7914	1.1402	1.1132	1.3989	1.3777	1.5308	1.7391	1.1242	0.0000	0.0022
Fibre yield / plot	216.5357	138.4791	135.2761	169.6610	166.9672	186.0016	209.9876	136.6558	0.9749	0.0000

CHAPTER - V

DISCUSSION

5.1 STUDIES ON GENETIC VARIABILITY, HERITABILITY AND GENETIC ADVANCE AS PER CENT OF MEAN

The success of any breeding programme depends upon the quantum of genetic variability present in the population. A wide spectrum of variability will enhance the chances of recovering desirable gene combinations. In addition to genetic variability, knowledge on heritability and genetic advance of each character would help to improve the efficiency of selection. Further, it helps to determine the nature of gene action and role of environment in the expression of the composite traits. Therefore, for successful improvement of any crop it is necessary to have a thorough knowledge on the variability, heritability and genetic advance present in the available material (Singh and Bains, 1967).

The results obtained on fifty genotypes of roselle on the variability, heritability and genetic advance as per cent of mean are discussed here under.

The phenotypic coefficients of variation ranged from 8.14% for days to 50% flowering to 43.39% for bark thickness and the genotypic coefficients of variation ranged from 8.08% for days to 50% flowering to 43.00% for bark thickness. Fibre weight per plant and fibre weight per plot showed comparatively high coefficients of variation over other traits. Comparatively less coefficients of variation were observed for the characters plant height, number of internodes per plant, internodal length and days to 50% flowering. Hemalatha (1990), Guptaji (1993) and Pullibai (2005)

in roselle and Adilakshmi (1992) in kenaf reported high phenotypic and genotypic coefficient of variation for fibre weight. Similar results of less coefficients of variation for the characters plant height and days to 50% flowering were observed by Aruna *et al.* (1989), Padmaja (1989) and Pullibai (2005) in roselle, Adilakshmi (1992) in kenaf. High genetic variability for the character bark thickness was observed by Pullibai (2005) in roselle.

High heritability with high genetic advance over per cent of mean was for the character fibre yield and bark thickness. Moderate genetic advancement with high heritability was recorded for the character days to 50% flowering. Remaining all characters recorded high heritability with high genetic advancement.

Pullibai (2005) in roselle, Madhavi Rani (1990) in kenaf and Sarma (1984) in ramie reported high heritability with high genetic advancement for the character bark thickness. High heritability with high genetic advancement was noticed by Thombre and patil (1985), Koorse (1987), Hemalatha (1990) Gupta (1993) and Pullibai (2005) in roselle, Adilakshmi (1992) in kenaf, Palit *et al.* (1996) in jute and Sarma (1984) in ramie for the character fibre yield.

Heritability with genetic advance was of more value than the former alone in predicting the effect of selection. If the heritability was mainly due to additive and non additive gene effects the expected genetic gain would be low and if there was additive gene effects only a high genetic advance may be expected. The highest genetic advance observed for bark thickness indicates that the maximum progress might be expected in bark thickness. Days to 50% flowering had low genetic advance indicating that the expression of this character was conditioned by non-additive genes. High heritability with high

genetic advance was observed for fibre yield per plant, bark thickness, fibre yield per plot and fibre-wood ratio. This indicates that selection would be effective for these traits in roselle. These traits are less susceptible to environment.

5.2 CORRELATIONS

Breeding for higher yield is the major objective in any crop improvement programme. Because of the complexity and preponderous effects of environment on yield, direct selection for yield may not be of much use. Hence, the study of the association of yield components with yield, which have a decisive role in influencing the yield may aid in selection (Singh and Bains, 1967).

In the present investigation, association of yield components among themselves and with yield was studied in 50 genotypes of roselle. The study revealed that most of the characters studied i.e. plant height, number of internodes, basal stem diameter, bark thickness, fibre length and fibre yield per plant were positively and significantly associated with fibre yield, the highest being fibre yield per plant and lowest being bark thickness. Two characters i.e. internodal length and fibre-wood ratio were negatively associated with fibre yield. Similar results of significant association of fibre yield with days to 50% flowering, plant height, basal stem diameter and fibre yield per plant was reported by Aruna *et al.* (1988) in roselle and Sita Devi *et al.* (1990) in kenaf and significant association of fibre yield with number of internodes was reported by Adilakshmi (1992) in kenaf.

5.2.1 Days to 50% flowering

Days to 50% flowering showed non significant association with plant height, number internodes, internodal length, basal stem diameter, bark thickness, fibre-wood ratio, fibre length, fibre yield per plant and fibre yield per plot. This was also reported by Pullibai (2005) in roselle.

5.2.2 Plant height

Plant height had significant positive association with number of internodes, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot. Aruna *et al.* (1988) in roselle reported a positive association of plant height with these characters.

5.2.3 Number of internodes

Number of internodes showed significant positive association with plant height, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot. Adilakshmi (1992) in kenaf observed positive correlation of number of internodes with internodal length, basal stem diameter and fibre length. Positive association of number of internodes per plant with bark thickness and fibre yield per plant was reported by Kantilal (1991) in kenaf.

5.2.4 Internodal length

The character internodal length showed significant negative association with plant height, number of internodes, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot and non significant positive association with days to 50% flowering and significant positive association with fibre-wood ratio. Negative association of internodal

length with plant height, number of internodes, basal stem diameter, bark thickness, fibre length and fibre yield per plant was also observed by Madhavi Rani (1990) in kenaf.

5.2.5 Basal Stem Diameter

Significant positive association of basal stem diameter was found with plant height, number of internodes, bark thickness, fibre length, fibre yield per plant and fibre yield per plot. It had significant negative association with internodal length and fibre-wood ratio. A similar report was observed by Madhavi Rani (1990) in kenaf for the character basal stem diameter.

5.2.6 Bark thickness

Bark thickness showed significant positive association with plant height, number of internodes, basal stem diameter, fibre length, fibre yield per plant and fibre yield per plot and significant negative association with internodal length. The positive significant association of bark thickness with plant height, number of internodes per plant, basal stem diameter, fibre length and fibre yield per plant is in conformity with the results obtained by Madhavi Rani (1990) in kenaf.

5.2.7 Fibre-wood ratio

Fibre-wood ratio had significant negative association with plant height, number of internodes, basal stem diameter, fibre length, fibre yield / plant and fibre yield per plot. It showed significant positive association with internodal length. A similar report was observed by Efrayimu (1993) in kenaf. He reported negative association of fibre wood ratio with basal stem diameter, fibre length and fibre yield per plant.

5.2.8 Fibre length

Fibre length character showed significant positive association with plant height, number of internodes, basal stem diameter, bark thickness, fibre yield per plant and fibre yield per plot but had a significant negative association with internodal length and fibre-wood ratio. Aruna *et al.* (1988) in roselle reported positive association of fibre length with plant height, number of internodes and basal stem diameter.

5.2.9 Fibre yield per plant

The significant positive association of fibre yield per plant with plant height, number of internodes, basal stem diameter, bark thickness, fibre length and fibre yield per plot and the significant negative association was observed for internodal length and fibre wood ratio. Except fibre length all the characters showed positive association with fibre yield per plant as per the observations of Aruna *et al.* (1988) in roselle.

5.2.10 Fibre yield per plot

Fibre yield per plot showed positive significant association with plant height, number of internodes, basal stem diameter, bark thickness, fibre length and fibre yield per plant. Significant negative association was observed with internodal length which is similar to the observations of Aruna *et al.* (1988) in roselle.

5.3 PATH COEFFICIENT ANALYSIS

The observed correlation between yield and a particular component character was the net result of direct effect of that character and indirect effects through other yield components. The total correlation between fibre

yield and a component character may sometimes be misleading as it might be an over estimate or underestimate because of its application with other characters which are also associated with yield. The direct effect may be different from the observed correlation. Hence, direct selection by correlated response sometimes may not be fruitful, when many characters are affecting a given character. It is necessary to split the correlation coefficients into direct and indirect effects of cause as devised by Wright (1921). Correlation in conjunction with path coefficient analysis will give a better insight into cause and effect relationship between different pairs of characters.

The present study using path coefficient analysis revealed that fibre yield per plot was under the positive direct influence of basal stem diameter bark thickness, fibre length and fibre yield per plant and negative direct effects were by days to 50% flowering, plant height, number of internodes, internodal length and fibre-wood ratio.

The results obtained so far indicate that basal diameter, bark thickness, fibre length and fibre yield per plant are the major characters contributing to yield. Therefore, preference for basal stem diameter and more bark thickness and with more fibre content and fibre length may result in improvement of fibre yield.

5.3.1 Days to 50% flowering

Days to 50% flowering had a negative direct effect on fibre yield per plot and its correlation with yield was positive and non-significant. Its indirect effects via plant height, number of internodes, basal stem diameter and bark thickness were also negative. However, the contribution of this trait through internodal length, fibre-wood ratio, fibre length and fibre yield / plant was

positive. These findings indicate that selection could be practiced on this character along with internodal length, fibre-wood ratio, fibre length and fibre yield / plant. These results were in conformity with the results of Krishna Veni and Krishna Murthy (2000b) in roselle, Kantilal (1991) and Adilakshmi (1992) in kenaf.

5.3.2 Plant height

Plant height exhibited negative direct effect and positive correlation with fibre yield per plot at phenotypic level. It had negative indirect effects through days to 50% flowering, number of internodes, Positive indirect effects were observed through internodal length, basal stem diameter, bark thickness fibre length and fibre yield per plant and fibre wood ratio. These results are in conformity with the results of Hemalatha (1990) and Krishna Veni and Krishna Murthy (2000b) in roselle, Kantilal (1991) and Erayimu (1993) in kenaf.

5.3.3 Number of internodes

Number of internodes per plant recorded negative direct effect on fibre yield, the observed correlation with yield was positive and significant It had a negative indirect effects through days to 50% flowering, plant height, positive indirect effects were observed via internodal length, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre-wood ratio. These results are in agreement with Krishna Veni and Krishna Murthy (2000b) in roselle, Sita Devi *et al.* (1990), Kantilal (1991) Adilakshmi (1992) and Erayimu (1993) in kenaf.

5.3.4 Internodal length

Internodal length had negative direct effect on fibre yield / plot and the correlation with fibre yield was negative and significant. It had positive indirect effects through days to 50% flowering, plant height, number of internodes, and negative indirect effect through basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre-wood ratio. Hence restrictions have to be imposed to nullify the undesirable negative effects. These findings are in agreement with Sita Devi *et al.* (1990) in kenaf.

5.3.5 Basal stem diameter

Basal stem diameter showed positive direct effect and positive significant correlation with fibre yield per plot. It had positive indirect effect through, days to 50% flowering, internodal length, bark thickness, fibre-wood ratio, fibre length and fibre yield per plant. Negative indirect effects were observed via plant height and number of internodes. These findings indicates that selection could be practiced on this character along with fibre yield per plant and fibre length which had maximum positive indirect contribution to yield. These findings are in agreement with results obtained by Hemalatha (1990), Kameswara Rao (1996) and Krishna Veni and Krishna Murthy (2000b) in roselle, Sita Devi *et al.* (1990), Kantilal (1991), Adilakshmi (1992) and Efrayimu (1993) in kenaf.

5.3.6 Bark thickness

Bark thickness recorded positive direct effect and significant positive correlation with fibre yield per plot at phenotypic level. It had negative indirect effect through plant height, number of internodes. Positive indirect effects

were observed via days to 50% flowering internodal length, basal stem diameter, fibre length, fibre yield per plant and fibre-wood ratio. Similar results were reported by Kantilal (1991) in kenaf.

5.3.7 Fibre-wood ratio

Fibre-wood ratio had a negative direct effect and had significant negative correlation with fibre yield per plot. This character showed positive indirect effects which were manifested through days to 50% flowering, plant height, number of internodes. The negative indirect effects were observed through internodal length, basal stem diameter, bark thickness, fibre length and fibre yield per plant. Similar results were reported by Adilakshmi (1992) in kenaf.

5.3.8 Fibre length

Fibre length recorded positive direct effect and significant positive correlation with fibre yield per plot at phenotypic level. The positive direct path value coupled with positive correlation obtained in the present investigation suggest that selection for internodal length, basal stem diameter, bark thickness, fibre-wood ratio, fibre length and fibre yield per plant would be highly effective for improvement of fibre yield per plot since the yield attributing traits had positive indirect effects on fibre length. These results are in agreement with Hemalatha (1990), Kameswara Rao (1996) and Krishna Veni and Krishna Murthy (2000b) in roselle, Sita Devi *et al.* (1990), Kantilal (1991) Adilakshmi (1992) and Efrayimu (1993) in kenaf,

5.3.9 Fibre yield per plant

Fibre yield per plant recorded the highest positive direct effect and positive correlation with fibre yield per plot. The characters internodal length, basal stem diameter, bark thickness, fibre-wood ratio and fibre length showed the positive indirect effects. Hence selection for these characters could be more effective for the increase of fibre yield per plot. Negative indirect effects were recorded through days to 50% flowering, plant height, number of internodes similar observations were recorded by Adilakshmi (1992) in kenaf.

5.4 DISCRIMINATION FUNCTION AND SELECTION INDICES

When selection is applied for the improvement of economic value of a plant, it is generally applied to several characters simultaneously because economic value depends on more than one character. This is usually referred to as multiple trait selection. The method that is expected to give more rapid improvement of economic value, however, is to apply selection simultaneously to all the component characters together by giving appropriate weights to each character according to its relative economic importance, its heritability and the genetic and phenotypic correlations between the different characters. The component characters have to be combined together into a score or index in such a way that selection applied to the index, as if the index were a single character will yield the most rapid possible improvement of economic value (Falconer, 1964).

Smith (1936) proposed a selection model for making selection on several characters simultaneously using discriminant function of Fisher (1936). He explained the hypothetical promises from which discriminant

function was derived. They are (i) the genotypic and environmental effects are additive to give the observed magnitude of characters (ii) they are independent and (iii) the genotypic yield as well as the phenotypic yield follow the normal distribution. Thus, the equation provides, the genotypic assessment of complex yield from its components.

In effecting varietal improvement for yield and for other desirable combinations of characters, the plant breeder desires to select superior genotypes. But in actual practice he has to choose individuals based on their phenotypic expressions. Many of the plant characters of economic value are quantitatively inherited and are highly influenced by environmental condition. Selection made on the basis of such characters in the field are liable to be influenced by a large position of non-heritable variability and is therefore, likely to be less efficient. This suggests the need for studying the relative amounts of heritable and non-heritable variability exhibited by individual characters. This could be estimated by calculating either (i) the correlation between the characters with the hope that the components are less susceptible to environmental fluctuations (ii) selection indices which would give the most appropriate weightage to the phenotypic values of each of the two or more components to be used simultaneously for selection (Simlote, 1947).

Selection of plants indiscriminately from a field on the basis of phenotypic expressions might lead to disappointing results. It is not the phenotypic character but the genotypic value that should be accounted to form the basis for selecting plants. Thus index based on economic characters should give weightage to the phenotypic expression in terms of genotype by

estimating environmental variation (Panse, 1949). The adoption of discriminant function solves the problem of apportioning the total effect by discriminating environmental effect and also by assigning relative weights to each of the yield components based on its genotypic contribution (Panse, 1957).

Accordingly, the discriminant function technique, employed in the present study to understand the simultaneous improvement of characters in roselle genotypes gives the genetic advance in fibre yield through classical and restriction selection indices.

5.4.1 Classical selection indices

Inverse of mean of a character was considered as weightage given to that particular character in the present study. This procedure of allotting weightage to characters might reduce the wide differences observed between the mean of characters and may give better validity to the computed genetic advance values. The high weighting coefficient values observed for bark thickness, fibre-wood ratio might be due to high weightage given for that character. The reciprocals of means of each character was used as relative weights of corresponding character by Aruna *et al.* (1988).

The high selection criterion value indicated that the genotypes ER 35A, 6283-4044, R-86, AS-81-18 and AR-34 were the productive genotypes.

In general, the indices which include more than one character gave high genetic advance suggesting the utility of construction of selection indices for effecting joint improvement of several characters. For example in this study a function involving eight characters viz., fibre yield per plot, days to

50% flowering, plant height, number of internodes, basal stem diameter, bark thickness, fibre length and fibre yield per plant gave highest genetic advance.

Inclusion of characters one by one in the function resulted in the increased efficiency of selection. Similar results were reported by Aruna *et al.* (1989) in roselle and Adilakshmi (1992) in kenaf. Abraham *et al.* (1954) stated that discriminant function may be useful where selection for a combination of characters was a case.

The present study of discriminant function along with index of genetic advance indicated that days to 50% flowering, plant height, number of internodes, basal stem diameter, bark thickness, fibre length, fibre weight per plant and fibre yield per plot are desirable traits included for index construction in roselle. The index with these traits gave efficient genetic advance values and relative efficiency and may be useful for simultaneous improvement of these characters. Highest contribution of yield was manifested by plant height and basal diameter in Ambadi (Navale, 1982), Aruna *et al.* (1988) in roselle and Adilakshmi (1992) in kenaf.

PATH ANALYSIS AND CLASSICAL SELECTION INDICES

The two techniques employed in the present study i.e. path analysis (based on cause and effect relationship) and the selection indices based on discriminant function are two different approaches for studying the genetic relationships among the characters. The path analysis partitions the observed correlation into direct effect of a component character and indirect effects via other component characters towards yield whereas in construction of selection indices based on discriminant function the weightage allotted to a

character is considered and the index with maximum genetic advance over fibre yield per plot will suggest the character combination for simultaneous improvement.

In the present study both techniques pointed out the importance of the characters plant height, basal diameter, bark thickness, fibre yield per plant, number of internodes, fibre length and days to 50% flowering. Selection indices and path analysis pointed out the possibility of improvement of fibre yield / plot with other characters. Path analysis indicates certain important characters contributing favourably towards fibre yield in roselle, whereas, selection indices suggests simultaneous improvement of characters over direct selection for yield and its components.

In both the techniques the characters internodal length and the fibre-wood ratio showed the negative effect in the improvement of yield.

5.4.2 Restricted Selection Indices

Under certain situations the breeder might like to effect change in the means of some characters while keeping the means of other characters unchanged. This is the case of restricted selection i.e. the breeder requires to maximize the correlation between the genetic worth value (H) of the genotype and the phenotypic performance value (I) of various characters of the genotype, such that the genetic advance in the restricted character becomes zero. A solution to this problem of index construction was given by Kempthorne and Nordskog (1959) by using logrange multiplier.

Using single restriction case, in respect of all the characters, days to 50% flowering, plant height, number of internodes, internodal length, basal

stem diameter, bark thickness, fibre-wood ratio, fibre length, fibre yield per plant and fibre yield per plot, restriction selection indices were computed in the present study and the genetic advance was calculated for each character in each restriction according to Singh and Chaudhary (1977).

The genetic advance values for a particular character under restriction was negligible or negative indicating successful cases of character restriction.

By restricting days to 50% flowering, plant height, number of internodes, internodal length, basal stem diameter, bark thickness, fibre-wood ratio and fibre length, highest genetic advance was observed for fibre yield per plot but when the restriction is imposed on fibre yield per plant and fibre yield per plot, highest genetic advance was observed for plant height.

CONCLUSIONS:

From the discussion of results on the study of genetic variability, heritability, genetic advance, character association, path coefficient analysis and selection indices using 50 genotypes of roselle, the following conclusions can be drawn.

1. The analysis of variance studies revealed that the genetic material used in the present investigation possessed very high variability and provide sufficient basis for selection by breeder.
2. The character association studies revealed that the characters plant height, number of internodes, basal stem diameter, bark thickness, fibre length and fibre yield per plant exhibited positive and significant association with fibre yield per plot and also showed significant association among themselves. Therefore, tall plants with more number of internodes with thick bark might result in improvement of fibre yield in roselle.
3. The path coefficient studies revealed that selection based on basal stem diameter, bark thickness, fibre length and fibre yield / plant would be useful as these characters showed high positive direct effect on fibre yield / plot.
4. The discriminant function studies revealed that the function including the characters fibre yield per plot, days to 50% flowering, plant height, number of internodes, basal stem diameter, bark thickness, fibre length and fibre yield per plant had high expected genetic advance. Hence the breeder has to select plants based on above characters for fibre yield improvement in roselle.

CHAPTER - VI

SUMMARY

Fifty roselle (*Hibiscus sabdariffa* L.) genotypes obtained from Agricultural Research Station, Amadalavalasa were tested at the College Farm, Agricultural College, Bapatla during kharif, 2005.

The genetic variability, correlations and path coefficients were computed for ten quantitative characters viz., days to 50% flowering, plant height, number of internodes, internodal length, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot. Simultaneous improvement of characters was assessed through discriminant function and selection indices for all the ten characters.

The analysis of variance indicated that the differences among the genotypes were significant for all the characters studied.

Heritability estimates were high for all the ten characters. High genetic advance was observed for all the characters except days to 50% flowering which indicates that these characters have the maximum genetic progress.

The character association studies indicated that the plant height, number of internodes, basal stem diameter, bark thickness, fibre length and fibre yield per plant exhibited positive association with fibre yield per plot, suggesting that selection for these characters would be helpful in improving the yield.

The results of path analysis revealed that the basal stem diameter, bark thickness, fibre length and fibre yield per plant manifested positive direct effect on fibre yield per plot. Further, these four characters also exhibited positive association with fibre yield suggesting that selection of these four

traits would be more effective to bring simultaneous improvement in yield and yield components in roselle.

The results of classical selection indices indicated that genotypes ER-35A, 6283-4044, R-86 AS-81-18 and AR-34 with high selection criterion values may be preferred. Studies on genetic advance and relative efficiency of indices indicated that a combination of 8 characters viz., days to 50% flowering, plant height, number of internodes, basal stem diameter, bark thickness, fibre length, fibre yield per plant and fibre yield per plot together formed efficient selection index and may be useful for simultaneous improvement of characters.

The results of restriction selection indices indicated that by restricting days to 50% flowering, plant height, number of internodes, internodal length, basal stem diameter, bark thickness, fibre-wood ratio and fibre length highest genetic advance was observed for the character fibre yield per plot.

LITERATURE CITED

- Abraham T P W T Butany and R.L.M.Gosh 1954 Discriminant function for varietal selection in rice. Indian Journal of Genetics 14: 51-53.
- Adilakshmi D 1992 Selection indices in kenaf (*Hibiscus cannabinus* L.) M.Sc.(Ag.) Thesis submitted to Andhrapradesh Agricultural Univeristy.
- Allard R W 1960 Principles of Plant Breeding. John Wiley and Sons Inc. London pp: 83-108.
- Anuradha T and Suriyakumari S 2002 Correlation and path coefficient analysis studies in F₂ generation in mesta (*Hibiscus sabdariffa* L.). Madras Agricultural Journal 89(7-9): 517-518.
- Anuradha T and Venkateswara Rao M 1993 Correlation and path analysis studies in mesta (*Hibiscus sabdariffa* L.). The Andhra Agricultural Journal 40: 40-42.
- Appalaswamy A Subramanyam D and Rama Kumar P V 1995 Correlation and path analysis studies in kenaf (*Hibiscus cannabinus* L.). Bulletin of pure and Applied Sciences 14B(2): 69-72.
- Aruna C Subramanyam D Ramakumar P V and Satyanarayana G 1988 Correlation and path analysis in roselle (*Hibiscus sabdariffa* L.). Journal of Research APAU XVII(I) 65-67.
- Aruna C 1988 Selection indices in mesta (*Hibiscus sabdariffa* L.). M.Sc.(Ag.) Thesis submitted to Andhrapradesh Agricultural Univeristy.
- Aruna C Subramanyam D Ramakumar P V and Satyanarayana G 1989 Selection indices in roselle (*Hibiscus sabdariffa* L.). Indian Journal of Genetics and Plant Breeding 49 (2): 277-279.
- Aruna C and Subramanyam D 1989 Variability, heritability and genetic advance in roselle (*Hibiscus sabdariffa* L.). Journal of Research APAU XVII(I): 188-189.
- Banerjee R Singh M K Roy M K G and Banerjee S P 1988 Correlation and path coefficient analysis of yield components in *Hibiscus sabdariffa* L. Jute Development Journal 8(4): 15-17.
- Bordoloi P K and Das P K 1999 Variability character association and path analysis in tossa jute (*Corchorus olitorius*). Annals of Agricultural Bio-Research 4(2): 179-181.
- Burton G W and Devane E W 1952 Estimating heritability in tall fescus (*Festuca arundinaceae*) from replicated clonal material. Agronomy Journal 45: 478-481.

- Chakraborty P Chowdhury and Hossain M 1996 Genetic variability and growth pattern of yield attributes in Olitorius jute (*Corchorus olitorius* L.). Indian Journal of Genetic and Plant Breeding 56(4): 425-436.
- Chaudhury S K Roy M K G and Sinha M K 1985 Genetic variability and heritability studies in tossa jute germplasm. Jute Development Journal 5(1): 56-37.
- Chaudhury S K Sinha M K and Singh D P 1981 Path analysis in tossa jute. Indian Journal of Agricultural Science 51(1): 772-775.
- Chawla B K and Prakash Singh 1984 Genetic divergence in linseed Journal of Agricultural Sciences. 54(4): 266-268.
- Cochran W G and Cox G M 1950. Experimental designs John Wiley Publishers, New York. Pp: 45-67.
- Dastidar K K G 2003 Genetic variability and association components in Capsularis jute (*Corchorus capsularis* L.) Journal of Interacademia 20(7): 388-395.
- Dewey D R and Lu K H 1959 A correlation and path coefficient analysis of components crested wheat grass. Agronomy Journal 51: 515-518.
- Dudley J W and Moll R H 1969 Interpretation and use of estimates of heritability and genetic variance in plant breeding. Crop Science 9: 257-262.
- Efrayimu B 1993 Genetic divergence in kenaf (*Hibiscus cannabinus* L.) M.Sc.(Ag.) Thesis submitted to Andhra Pradesh Agricultural University.
- Falconer D S 1964 Introduction to quantitative genetics. Oliven and Boyd, Edinberg.
- *Fisher R A 1936 The use of multiple measurements in taxonomic problems Annals of Eugenics 7: 179-188.
- Fisher R A and Yates F 1963 Statistical tables for biological agricultural and medical research (*Oliver and Boyd*). London pp: 46-63.
- Ghosh Dastidar K K Das S 2003 Genetic variability of resistance to premature flowering and its effects on the component characters contributing to fibre yield of tossa jute (*Corchorus olitorius* L.) Journal of Inter academician 7(3): 248-255.
- Ghosh R C M Dastidar K K and Bhaduri P N 1983 Genetic variability and association of characters at different doses of nitrogen and sowing dates in Capsularis jute. Indian Journal of Genetics 43: 143-148.

- Ghosh Dastidar K K Agarwalla K K and Roy Chowdhury P 1993 Genetic variability and association of component characters for seed yield in *Olitorius jute*. Indian Journal of Genetics, 53(2): 157-160.
- Guptaji N V S B K 1993 Stability analysis in roselle (*Hibiscus sabdariffa* L.). M.Sc.(Ag.) Thesis submitted to Andhra Pradesh Agricultural University.
- Hanson C H Robinson H F and Comstock R E 1956 Biometrical studies of yield in segregating populations of Korean lespedza. Agronomy Journal 48(6): 268-272.
- *Hazel L N 1943 The genetic basis for constructing selection indices Ann. Eugen. 7: 240-250.
- Hemalatha P V 1990 Genetic studies inter varietal crosses of roselle (*Hibiscus sabdariffa* L.) M.Sc.(Ag.) Thesis submitted to Andhra Pradesh Agricultural University.
- Ingale B V 1985 An analysis of association of characters of value in breeding linseed (*Linum usitatissimum* L.) varieties. Jute Development Journal 1(1): 30-33.
- Iruthayaraj M R Rajendran P and Morachan Y B 1981 Effects of dates of harvest on mesta (*Hibiscus cannabinus* L.) varieties. Jute Development Journal 1(1): 30-33.
- Johnson H W Robinson H F and Comstock R E 1955 Estimates of genetic and environmental variabilities in Soybean. Agronomy Journal 47: 314-318.
- Kabi T and Bhaduri P N 1982 A multivariate analysis of leaf area in jute genotypes. Indian Journal of Genetics and Plant Breeding 41: 277-284.
- Kameswara Rao K 1996 Study of metroglyph analysis in roselle (*Hibiscus sabdariffa* L.) M.Sc.(Ag.) Thesis submitted to Andhra Pradesh Agricultural University.
- Kanakadurga N 1985 Genetic divergence in mesta (*Hibiscus sabdariffa* L.) M.Sc.(Ag.) Thesis submitted to Andhra Pradesh Agricultural University.
- Kantilal D 1991 Genetic studies in F₂ progeny of sixteen kenaf crosses (*Hibiscus cannabinus* L.) M.Sc.(Ag.) Thesis submitted Andhra Pradesh Agricultural University.
- Kapoor C J and Chawla B K 1983 Genetic parameters and association among yield and yield components in linseed. Madras Agricultural Journal 70(6): 401-403.

- Kemphorne O and Nordskog A W 1959 Restriction selection indices
Biometrics 15: 10-19.
- Koorse 1987 Genetic variability studies in roselle (*Hibiscus sabdariffa* L.)
Mysore Journal of Agricultural Sciences 21(1): 90-91.
- Krishna Veni B 2000 Character association studies in *Hibiscus sabdariffa* L.
Journal of Research ANGRAU 29(4): 25-30.
- Krishna Veni B 2001 Character association studies in *Hibiscus sabdariffa* L.
Journal of Research ANGRAU 28(4): 25-30.
- Krishna Veni B and Krishna Murthy B 2000a Studies on variability
heritability and genetic advance in inter varietal progenies of roselle
(*Hibiscus sabdariffa* L.) Journal of Research ANGRAU 28(1-2): 27-31.
- Krishna Veni B and Krishna Murthy B 2000b Path analysis studies in F₂ and
F₃ generations of roselle (*Hibiscus sabdariffa* L.) Journal of Research
ANGRAU 28(1-2): 23-26.
- Kumar V Idem N U A and Ecrekwu C A 1985 yield components of five
roselle (*Hibiscus sabdariffa* L.) varieties in Northern Nigeria. East
African Agricultural and Forestry Journal 2: 108-112.
- Madhavi Rani A 1990 Studies on heterosis and combining ability in kenaf
(*Hibiscus cannabinus* L.). M.Sc. (Ag.) Thesis submitted to Andhra
Pradesh Agricultural University.
- Maity S N P Datta Biswas S R and Sen S 1983 A study of growth pattern
in Jute (*Corchorus olitorius* L.) Acta. Agron. Acad. Science; Hungan.
32: 348-355.
- Mohan Rao G 1994 Combining ability and heterosis in kenaf (*Hibiscus
cannabinus* L.) M.Sc.(Ag.) Thesis submitted to Andhra Pradesh
Agricultural University.
- Narendhra Singh and Dikshit N N 1988 Heritability and genetic advance in
linseed. Indian Journal of Agricultural Sciences 58(7): 552-553.
- Navale P A 1982 Correlation and regression studies of some yield
components in the F₂ population of Ambadi (*Hibiscus cannabinus* L.).
Journal of Maharashtra Agricultural Universities 6(3): 197-198.
- Navale P A and Senone H M 1981 Correlation and regression of fibre yield
with its components in Ambadi (*Hibiscus cannabinus* L.) Journal of
maharashtra Agricultural Universities. 6(3): 197-198.
- Padmaja P 1989 Heterotic studies on roselle (*Hibiscus sabdariffa* L.).
M.Sc.(Ag.) Thesis submitted to Andhra Pradesh Agricultural
University.

- Palit P Sasmal B C and Bhattacharya A C 1996 Germplasm diversity and estimate of genetic advance of four morpho-physiological traits in a world collection of Jute. *Euphytica* 90(1): 49-58.
- Palve S M Kumar D Chaudhury S K and Gupta D 2003 Genetic variation for seed yield components in jute (*Corehorus spp*). *Indian Journal of Genetics and Plant Breeding* 63(3) 235-238.
- *Panse V G 1949 A discriminant function for selection of yield in cotton. *Indian cotton Grow. Rew.* 3(4): 179-185.
- Panse V G 1957 Genetics of quantitative characters in relation to plant breeding. *Indian Journal of Genetics* 17: 318-328.
- Pullibai P 2005 Character association and genetic divergence in roselle hemp (*Hibiscus sabdariffa* L.) M.Sc.(Ag.) Thesis submitted to Andhra Pradesh Agricultural University.
- Rao S K and Singh S P 1983 Analysis of yield factors in segregating populations and their implications in selection of flax (*Linum usitatissimum* L). *Canadian Journal of Genetics, Cytology* 25(5): 495-501.
- Robinson H F Comstock R R Harvey P H 1951 Genotypic and phenotypic correlation in corn and their implication in selection. *Agronomy Journal* 43: 286-287.
- Roy S and Ghosh Dastidar K K 2004 Association of leaf characters with fibre yield plant height and base diameter in tossa jute (*corchorus olitarius* L.). *Indian Journal of Genetics and Plant Breeding* 64(3): 249-250.
- Sarma B K 1984 Interrelationship between yield and yield components in ramie (*Bochmeria nivea* L.). *Jute Development Journal* 4(4): 19-24.
- Shrivas S R and Singh S P 1983 Heritability and genetic advance in linseed (*Linum usitatissimum* L.) *Indian Journal of Genetics*, 44(2): 235-238.
- Simlote K M 1947 An application of discriminant function in durum wheat. *Indian Journal of Agricultural Sciences* 17: 269-280.
- Singh R B and Bains S S 1967 Genetic divergence for ginning out turn and its components in upland cotton. *Indian Journal of Genetics and Plant Breeding* 28: 262-288.
- Singh R K and Chaudhary B D 1977 Biometrical methods in quantitative genetic analysis. Kalyani Publishers, New Delhi pp: 281-300.

- Sinha M K Roy M K G and Chaudhury S K 1986 Correlation and path coefficient analysis in mesta. Indian Journal of Agricultural Sciences 56(2): 83-85.
- Sita Devi B Subramanyam D Ramakumar P V and Satyanarayana G 1990 Heritability, Correlation and path analysis of kenaf (*Hibiscus sabdariffa* L.) Journal of Tropical Agriculture 8: 268-271.
- *Smith H F 1936 A discriminant function for plant selection. Annals of Eugenics 7: 240-250.
- Subramanyam D Ramakumar P V Krishna Murthy B and Ismail S 1995 Heritability and correlation studies in kenaf (*Hibiscus cannabinus* L.) Indian Journal of Genetics and Plant Breeding 55(3): 279-282.
- Thombre M V and Patil R C 1985 Genetic architecture of raw fibre yield and its components in kenaf (*Hibiscus cannabinus* L.). Journal of Maharashtra Agricultural University 3(2): 86-89.
- Thrithamallappa and Sheriff R A 1991 Genetic variability studies in roselle. Current Research Vol. XX (12): 257-258.
- Wright S 1921 Correlation and Causation Journal of Agricultural Research 20: 557-585.
- XU-Qibin 2000 Correlation and path analysis of several quantitative characteristics in *Hibiscus cannabinus* L. China-S-Fibre-Crops : 22(3): 6-9.
- Yadav O P Gupta S K Lather B P S 2004 Genetic variability in Sunnhemp (*Crotalaria juncea* L.) Agriculture Science Digest 24(3): 231-232.

* Original not seen

Literature citation is in accordance with the guidelines by Acharya N.G. Ranga
Agricultural University, Rajendranagar, Hyderabad.

APPENDICES

Discriminant function, expected genetic advance and relative efficiency over fibre yield per plot in 50 roselle genotypes

Selection Index	Discriminant function	Genetic advance	Relative efficiency (%)
1	2	3	4
x_1	$0.0004x_1$	0.57	100
x_2	$0.0088x_2$	0.17	29.25
x_3	$0.0106x_3$	0.28	49.61
x_4	$0.0190x_4$	0.2	35.07
x_5	$0.1507x_5$	0.3	52.26
x_6	$0.5952x_6$	0.46	82.02
x_7	$3.4615x_7$	0.88	155.22
x_8	$2.4851x_8$	0.53	93.24
x_9	$0.0027x_9$	0.3	53.47
x_{10}	$0.2451x_{10}$	0.56	99.3
$x_1 \ x_2$	$0.0004x_1 + 0.0088x_2$	0.61	107.2
$x_1 \ x_3$	$0.0004x_1 + 0.0106x_3$	0.8	142.07
$x_1 \ x_4$	$0.0004x_1 + 0.0190x_4$	0.73	129.45
$x_1 \ x_5$	$0.0004x_1 + 0.1507x_5$	0.44	78.47
$x_1 \ x_6$	$0.0004x_1 + 0.5952x_6$	0.93	165.21
$x_1 \ x_7$	$0.0004x_1 + 3.4615x_7$	1.27	224.09
$x_1 \ x_8$	$0.0004x_1 + 2.4851x_8$	0.66	117.27
$x_1 \ x_9$	$0.0004x_1 + 0.0027x_9$	0.83	146.07
$x_1 \ x_{10}$	$0.0004x_1 + 0.2451x_{10}$	1.13	199.32
$x_2 \ x_3$	$0.0088x_2 + 0.0106x_3$	0.33	58.76
$x_2 \ x_4$	$0.0088x_2 + 0.0190x_4$	0.26	45.34
$x_2 \ x_5$	$0.0088x_2 + 0.1507x_5$	0.33	58.68
$x_2 \ x_6$	$0.0088x_2 + 0.5952x_6$	0.48	84.56

1		2	3	4
x ₂	x ₇	0.0088x ₂ +3.4615x ₇	0.88	156.16
x ₂	x ₈	0.0088x ₂ +2.4851x ₈	0.54	96.29
x ₂	x ₉	0.0088x ₂ +0.0027x ₉	0.35	62.21
x ₂	x ₁₀	0.0088x ₂ +0.2451x ₁₀	0.6	106.39
x ₃	x ₄	0.0106x ₃ +0.0190x ₄	0.48	84.27
x ₃	x ₅	0.0106x ₃ +0.1507x ₅	0.2	34.77
x ₃	x ₆	0.0106x ₃ +0.5952x ₆	0.72	127.9
x ₃	x ₇	0.0106x ₃ +3.4615x ₇	1.08	190.76
x ₃	x ₈	0.0106x ₃ +2.4851x ₈	0.48	85.18
x ₃	x ₉	0.0106x ₃ +0.0027x ₉	0.59	103.48
x ₃	x ₁₀	0.0106x ₃ +0.2451x ₁₀	0.8	141.45
x ₄	x ₅	0.0190x ₄ +0.1507x ₅	0.17	30.56
x ₄	x ₆	0.0190x ₄ +0.5952x ₆	0.64	113.29
x ₄	x ₇	0.0190x ₄ +3.4615x ₇	1.01	178.23
x ₄	x ₈	0.0190x ₄ +2.4851x ₈	0.49	86.43
x ₄	x ₉	0.0190x ₄ +0.0027x ₉	0.5	88.36
x ₄	x ₁₀	0.0190x ₄ +0.2451x ₁₀	0.73	128.82
x ₅	x ₆	0.1507x ₅ +0.5952x ₆	0.38	66.89
x ₅	x ₇	0.1507x ₅ +3.4615x ₇	0.8	142.05
x ₅	x ₈	0.1507x ₅ +2.4851x ₈	0.7	123.04
x ₅	x ₉	0.1507x ₅ +0.0027x ₉	0.19	34.41
x ₅	x ₁₀	0.1507x ₅ +0.2451x ₁₀	0.44	77.69
x ₆	x ₇	0.5952x ₆ +3.4615x ₇	1.27	224.55
x ₆	x ₈	0.5952x ₆ +2.4851x ₈	0.59	104.2
x ₆	x ₉	0.5952x ₆ +0.0027x ₉	0.75	131.85
x ₆	x ₁₀	0.5952x ₆ +0.2451x ₁₀	0.93	164.64
x ₇	x ₈	3.4615x ₇ +2.4851x ₈	1.01	179.33
x ₇	x ₉	3.4615x ₇ +0.0027x ₉	1.1	194.37
x ₇	x ₁₀	3.4615x ₇ +0.2451x ₁₀	1.27	223.91
x ₈	x ₉	2.4851x ₈ +0.0027x ₉	0.49	87.23
x ₈	x ₁₀	2.4851x ₈ +0.2451x ₁₀	0.66	117.26

1			2	3	4
x ₉	x ₁₀		0.0027x ₉ +0.2451x ₁₀	0.82	145.48
x ₁	x ₂	x ₃	0.0004x ₁ +0.0088x ₂ +0.0106x ₃	0.84	147.69
x ₁	x ₂	x ₄	0.0004x ₁ +0.0088x ₂ +0.0190x ₄	0.76	134.98
x ₁	x ₂	x ₅	0.0004x ₁ +0.0088x ₂ +0.1507x ₅	0.49	86.63
x ₁	x ₂	x ₆	0.0004x ₁ +0.0088x ₂ +0.5952x ₆	0.95	168.39
x ₁	x ₂	x ₇	0.0004x ₁ +0.0088x ₂ +3.4615x ₇	1.28	226.15
x ₁	x ₂	x ₈	0.0004x ₁ +0.0088x ₂ +2.4851x ₈	0.69	122.33
x ₁	x ₂	x ₉	0.0004x ₁ +0.0088x ₂ +0.0027x ₉	0.86	151.6
x ₁	x ₂	x ₁₀	0.0004x ₁ +0.0088x ₂ +0.2451x ₁₀	1.16	204.5
x ₁	x ₃	x ₄	0.0004x ₁ +0.0106x ₃ +0.0190x ₄	0.99	174.21
x ₁	x ₃	x ₅	0.0004x ₁ +0.0106x ₃ +0.1507x ₅	0.63	111.07
x ₁	x ₃	x ₆	0.0004x ₁ +0.0106x ₃ +0.5952x ₆	1.19	211.29
x ₁	x ₃	x ₇	0.0004x ₁ +0.0106x ₃ +3.4615x ₇	1.5	265.02
x ₁	x ₃	x ₈	0.0004x ₁ +0.0106x ₃ +2.4851x ₈	0.8	141.55
x ₁	x ₃	x ₉	0.0004x ₁ +0.0106x ₃ +0.0027x ₉	1.09	192.17
x ₁	x ₃	x ₁₀	0.0004x ₁ +0.0106x ₃ +0.2451x ₁₀	1.36	239.99
x ₁	x ₄	x ₅	0.0004x ₁ +0.0190x ₄ +0.1507x ₅	0.56	99.33
x ₁	x ₄	x ₆	0.0004x ₁ +0.0190x ₄ +0.5952x ₆	1.12	197.29
x ₁	x ₄	x ₇	0.0004x ₁ +0.0190x ₄ +3.4615x ₇	1.42	251.82
x ₁	x ₄	x ₈	0.0004x ₁ +0.0190x ₄ +2.4851x ₈	1.76	134.37
x ₁	x ₄	x ₉	0.0004x ₁ +0.0190x ₄ +0.0027x ₉	1.01	178.35
x ₁	x ₄	x ₁₀	0.0004x ₁ +0.0190x ₄ +0.2451x ₁₀	1.29	228.01
x ₁	x ₅	x ₆	0.0004x ₁ +0.1507x ₅ +0.5952x ₆	0.77	135.8
x ₁	x ₅	x ₇	0.0004x ₁ +0.1507x ₅ +3.4615x ₇	1.13	199.26
x ₁	x ₅	x ₈	0.0004x ₁ +0.1507x ₅ +2.4851x ₈	0.66	116.72
x ₁	x ₅	x ₉	0.0004x ₁ +0.1507x ₅ +0.0027x ₉	0.65	114.3
x ₁	x ₅	x ₁₀	0.0004x ₁ +0.1507x ₅ +0.2451x ₁₀	0.97	171.21
x ₁	x ₆	x ₇	0.0004x ₁ +0.5952x ₆ +3.4615x ₇	1.67	295.15
x ₁	x ₆	x ₈	0.0004x ₁ +0.5952x ₆ +2.4851x ₈	0.92	162.72
x ₁	x ₆	x ₉	0.0004x ₁ +0.5952x ₆ +0.0027x ₉	1.22	215.46
x ₁	x ₆	x ₁₀	0.0004x ₁ +0.5952x ₆ +0.2451x ₁₀	1.47	259.86

1			2			3	4
x_1	x_7	x_8	$0.0004x_1$	$+3.4615x_7$	$+2.4851x_8$	1.31	230.94
x_1	x_7	x_9	$0.0004x_1$	$+3.4615x_7$	$+0.0027x_9$	1.52	269.03
x_1	x_7	x_{10}	$0.0004x_1$	$+3.4615x_7$	$+0.2451x_{10}$	1.75	310.04
x_1	x_8	x_9	$0.0004x_1$	$+2.4851x_8$	$+0.0027x_9$	0.82	145.42
x_1	x_8	x_{10}	$0.0004x_1$	$+2.4851x_8$	$+0.2451x_{10}$	1.11	196.66
x_1	x_9	x_{10}	$0.0004x_1$	$+0.0027x_9$	$+0.2451x_{10}$	1.38	243.92
x_2	x_3	x_4	$0.0088x_2$	$+0.0106x_3$	$+0.0190x_4$	0.51	89.8
x_2	x_3	x_5	$0.0088x_2$	$+0.0106x_3$	$+0.1507x_5$	0.26	45.31
x_2	x_3	x_6	$0.0088x_2$	$+0.0106x_3$	$+0.5952x_6$	0.74	130.08
x_2	x_3	x_7	$0.0088x_2$	$+0.0106x_3$	$+3.4615x_7$	1.08	191.88
x_2	x_3	x_8	$0.0088x_2$	$+0.0106x_3$	$+2.4851x_8$	0.5	89.28
x_2	x_3	x_9	$0.0088x_2$	$+0.0106x_3$	$+0.0027x_9$	0.62	108.88
x_2	x_3	x_{10}	$0.0088x_2$	$+0.0106x_3$	$+0.2451x_{10}$	0.83	146.98
x_2	x_4	x_5	$0.0088x_2$	$+0.0190x_4$	$+0.1507x_5$	0.23	40.19
x_2	x_4	x_6	$0.0088x_2$	$+0.0190x_4$	$+0.5952x_6$	0.65	115.01
x_2	x_4	x_7	$0.0088x_2$	$+0.0190x_4$	$+3.4615x_7$	1.01	178.96
x_2	x_4	x_8	$0.0088x_2$	$+0.0190x_4$	$+2.4851x_8$	0.51	89.55
x_2	x_4	x_9	$0.0088x_2$	$+0.0190x_4$	$+0.0027x_9$	0.53	93.73
x_2	x_4	x_{10}	$0.0088x_2$	$+0.0190x_4$	$+0.2451x_{10}$	0.76	134.25
x_2	x_5	x_6	$0.0088x_2$	$+0.1507x_5$	$+0.5952x_6$	0.39	68.95
x_2	x_5	x_7	$0.0088x_2$	$+0.1507x_5$	$+3.4615x_7$	0.81	142.56
x_2	x_5	x_8	$0.0088x_2$	$+0.1507x_5$	$+2.4851x_8$	0.71	124.8
x_2	x_5	x_9	$0.0088x_2$	$+0.1507x_5$	$+0.0027x_9$	0.26	45.21
x_2	x_5	x_{10}	$0.0088x_2$	$+0.1507x_5$	$+0.2451x_{10}$	0.48	85.73
x_2	x_6	x_7	$0.0088x_2$	$+0.5952x_6$	$+3.4615x_7$	1.27	224.24
x_2	x_6	x_8	$0.0088x_2$	$+0.5952x_6$	$+2.4851x_8$	0.59	104.89
x_2	x_6	x_9	$0.0088x_2$	$+0.5952x_6$	$+0.0027x_9$	0.76	134.02
x_2	x_6	x_{10}	$0.0088x_2$	$+0.5952x_6$	$+0.2451x_{10}$	0.95	167.73
x_2	x_7	x_8	$0.0088x_2$	$+3.4615x_7$	$+2.4851x_8$	1.01	179.37
x_2	x_7	x_9	$0.0088x_2$	$+3.4615x_7$	$+0.0027x_9$	1.11	195.52
x_2	x_7	x_{10}	$0.0088x_2$	$+3.4615x_7$	$+0.2451x_{10}$	1.28	228.89

1			2			3	4
x_2	x_8	x_9	$0.0088x_2$	$+2.4851x_8$	$+0.0027x_9$	0.52	91.33
x_2	x_8	x_{10}	$0.0088x_2$	$+2.4851x_8$	$+0.2451x_{10}$	0.69	122.19
x_2	x_9	x_{10}	$0.0088x_2$	$+0.0027x_9$	$+0.2451x_{10}$	0.85	150.92
x_3	x_4	x_5	$0.0106x_3$	$+0.0190x_4$	$+0.1507x_5$	0.3	52.54
x_3	x_4	x_6	$0.0106x_3$	$+0.0190x_4$	$+0.5952x_6$	0.91	160.86
x_3	x_4	x_7	$0.0106x_3$	$+0.0190x_4$	$+3.4615x_7$	1.23	217.89
x_3	x_4	x_8	$0.0106x_3$	$+0.0190x_4$	$+2.4851x_8$	0.55	97.17
x_3	x_4	x_9	$0.0106x_3$	$+0.0190x_4$	$+0.0027x_9$	0.78	138.38
x_3	x_4	x_{10}	$0.0106x_3$	$+0.0190x_4$	$+0.2451x_{10}$	0.98	173.65
x_3	x_5	x_6	$0.0106x_3$	$+0.1507x_5$	$+0.5952x_6$	0.57	100.34
x_3	x_5	x_7	$0.0106x_3$	$+0.1507x_5$	$+3.4615x_7$	0.95	168.71
x_3	x_5	x_8	$0.0106x_3$	$+0.1507x_5$	$+2.4851x_8$	0.56	98.62
x_3	x_5	x_9	$0.0106x_3$	$+0.1507x_5$	$+0.0027x_9$	0.4	71.05
x_3	x_6	x_{10}	$0.0106x_3$	$+0.5952x_6$	$+0.2451x_{10}$	0.62	110.35
x_3	x_6	x_7	$0.0106x_3$	$+0.5952x_6$	$+3.4615x_7$	1.49	264.37
x_3	x_6	x_8	$0.0106x_3$	$+0.5952x_6$	$+2.4851x_8$	0.73	128.76
x_3	x_6	x_9	$0.0106x_3$	$+0.5952x_6$	$+0.0027x_9$	1.02	179.68
x_3	x_6	x_{10}	$0.0106x_3$	$+0.5952x_6$	$+0.2451x_{10}$	1.19	210.76
x_3	x_7	x_8	$0.0106x_3$	$+3.4615x_7$	$+2.4851x_8$	1.14	201.38
x_3	x_7	x_9	$0.0106x_3$	$+3.4615x_7$	$+0.0027x_9$	1.33	235.44
x_3	x_7	x_{10}	$0.0106x_3$	$+3.4615x_7$	$+0.2451x_{10}$	1.5	264.8
x_3	x_8	x_9	$0.0106x_3$	$+2.4851x_8$	$+0.0027x_9$	0.61	107.46
x_3	x_8	x_{10}	$0.0106x_3$	$+2.4851x_8$	$+0.2451x_{10}$	0.8	141.42
x_3	x_9	x_{10}	$0.0106x_3$	$+0.0027x_9$	$+0.2451x_{10}$	1.08	191.62
x_4	x_5	x_6	$0.0190x_4$	$+0.1507x_5$	$+0.5952x_6$	0.49	86.63
x_4	x_5	x_7	$0.0190x_4$	$+0.1507x_5$	$+3.4615x_7$	0.89	157.45
x_4	x_5	x_8	$0.0190x_4$	$+0.1507x_5$	$+2.4851x_8$	0.59	104.35
x_4	x_5	x_9	$0.0190x_4$	$+0.1507x_5$	$+0.0027x_9$	0.31	55.1
x_4	x_5	x_{10}	$0.0190x_4$	$+0.1507x_5$	$+0.2451x_{10}$	0.56	98.6
x_4	x_6	x_7	$0.0190x_4$	$+0.5952x_6$	$+3.4615x_7$	1.42	250.95
x_4	x_6	x_8	$0.0190x_4$	$+0.5952x_6$	$+2.4851x_8$	0.68	120.44

1				2				3	4
X ₄	X ₆	X ₉		0.0190x ₄	+0.5952x ₆	+0.0027x ₉		0.93	164.93
X ₄	X ₆	X ₁₀		0.0190x ₄	+0.5952x ₆	+0.2451x ₁₀		1.11	196.76
X ₄	X ₇	X ₈		0.0190x ₄	+3.4615x ₇	+2.4851x ₈		1.09	193.32
X ₄	X ₇	X ₉		0.0190x ₄	+3.4615x ₇	+0.0027x ₉		1.25	221.75
X ₄	X ₇	X ₁₀		0.0190x ₄	+3.4615x ₇	+0.2451x ₁₀		1.42	251.61
X ₄	X ₈	X ₉		0.0190x ₄	+2.4851x ₈	+0.0027x ₉		0.57	100.52
X ₄	X ₈	X ₁₀		0.0190x ₄	+2.4851x ₈	+0.2451x ₁₀		0.76	134.28
X ₄	X ₉	X ₁₀		0.0190x ₄	+0.0027x ₉	+0.2451x ₁₀		1.01	177.8
X ₅	X ₆	X ₇		0.1507x ₅	+0.5952x ₆	+3.4615x ₇		1.15	203.73
X ₅	X ₆	X ₈		0.1507x ₅	+0.5952x ₆	+2.4851x ₈		0.63	110.97
X ₅	X ₆	X ₉		0.1507x ₅	+0.5952x ₆	+0.0027x ₉		0.58	103.29
X ₅	X ₆	X ₁₀		0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀		0.76	135.18
X ₅	X ₇	X ₈		0.1507x ₅	+3.4615x ₇	+2.4851x ₈		1.01	178.77
X ₅	X ₇	X ₉		0.1507x ₅	+3.4615x ₇	+0.0027x ₉		0.97	171.52
X ₅	X ₇	X ₁₀		0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀		1.13	199.11
X ₅	X ₈	X ₉		0.1507x ₅	+2.4851x ₈	+0.0027x ₉		0.56	98.25
X ₅	X ₈	X ₁₀		0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀		0.66	116.79
X ₅	X ₉	X ₁₀		0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀		0.64	113.61
X ₆	X ₇	X ₈		0.5952x ₆	+3.4615x ₇	+2.4851x ₈		1.31	232.22
X ₆	X ₇	X ₉		0.5952x ₆	+3.4615x ₇	+0.0027x ₉		1.52	268.17
X ₆	X ₇	X ₁₀		0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀		1.67	294.93
X ₆	X ₈	X ₉		0.5952x ₆	+2.4851x ₈	+0.0027x ₉		0.75	132.52
X ₆	X ₈	X ₁₀		0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀		0.92	162.57
X ₆	X ₉	X ₁₀		0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀		1.22	214.94
X ₇	X ₈	X ₉		3.4615x ₇	+2.4851x ₈	+0.0027x ₉		1.16	204.69
X ₇	X ₈	X ₁₀		3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		1.31	231.07
X ₇	X ₉	X ₁₀		3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		1.52	268.82
X ₈	X ₉	X ₁₀		2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		0.82	145.29
X ₁	X ₂	X ₃	X ₄	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	1.01	178.74
X ₁	X ₂	X ₃	X ₅	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	0.66	117.54
X ₁	X ₂	X ₃	X ₆	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	1.21	214.11

1				2				3	4
x_1	x_2	x_3	x_7	$0.0004x_1$	$+0.0088x_2$	$+0.0106x_3$	$+3.4615x_7$	1.51	267.02
x_1	x_2	x_3	x_8	$0.0004x_1$	$+0.0088x_2$	$+0.0106x_3$	$+2.4851x_8$	0.83	146.25
x_1	x_2	x_3	x_9	$0.0004x_1$	$+0.0088x_2$	$+0.0106x_3$	$+0.0027x_9$	1.11	196.75
x_1	x_2	x_3	x_{10}	$0.0004x_1$	$+0.0088x_2$	$+0.0106x_3$	$+0.2451x_{10}$	1.38	244.59
x_1	x_2	x_4	x_5	$0.0004x_1$	$+0.0088x_2$	$+0.0190x_4$	$+0.1507x_5$	0.6	105.76
x_1	x_2	x_4	x_6	$0.0004x_1$	$+0.0088x_2$	$+0.0190x_4$	$+0.5952x_6$	1.13	199.89
x_1	x_2	x_4	x_7	$0.0004x_1$	$+0.0088x_2$	$+0.0190x_4$	$+3.4615x_7$	1.43	253.6
x_1	x_2	x_4	x_8	$0.0004x_1$	$+0.0088x_2$	$+0.0190x_4$	$+2.4851x_8$	0.78	138.71
x_1	x_2	x_4	x_9	$0.0004x_1$	$+0.0088x_2$	$+0.0190x_4$	$+0.0027x_9$	1.03	182.82
x_1	x_2	x_4	x_{10}	$0.0004x_1$	$+0.0088x_2$	$+0.0190x_4$	$+0.2451x_{10}$	1.31	232.49
x_1	x_2	x_5	x_6	$0.0004x_1$	$+0.0088x_2$	$+0.1507x_5$	$+0.5952x_6$	0.79	139.14
x_1	x_2	x_5	x_7	$0.0004x_1$	$+0.0088x_2$	$+0.1507x_5$	$+3.4615x_7$	1.14	201.22
x_1	x_2	x_5	x_8	$0.0004x_1$	$+0.0088x_2$	$+0.1507x_5$	$+2.4851x_8$	0.69	121.21
x_1	x_2	x_5	x_9	$0.0004x_1$	$+0.0088x_2$	$+0.1507x_5$	$+0.0027x_9$	0.68	120.67
x_1	x_2	x_5	x_{10}	$0.0004x_1$	$+0.0088x_2$	$+0.1507x_5$	$+0.2451x_{10}$	1	176.81
x_1	x_2	x_6	x_7	$0.0004x_1$	$+0.0088x_2$	$+0.5952x_6$	$+3.4615x_7$	1.67	298.99
x_1	x_2	x_6	x_8	$0.0004x_1$	$+0.0088x_2$	$+0.5952x_6$	$+2.4851x_8$	0.93	165.11
x_1	x_2	x_6	x_9	$0.0004x_1$	$+0.0088x_2$	$+0.5952x_6$	$+0.0027x_9$	1.23	218.26
x_1	x_2	x_6	x_{10}	$0.0004x_1$	$+0.0088x_2$	$+0.5952x_6$	$+0.2451x_{10}$	1.49	263.05
x_1	x_2	x_7	x_8	$0.0004x_1$	$+0.0088x_2$	$+3.4615x_7$	$+2.4851x_8$	1.31	232.35
x_1	x_2	x_7	x_9	$0.0004x_1$	$+0.0088x_2$	$+3.4615x_7$	$+0.0027x_9$	1.53	271.05
x_1	x_2	x_7	x_{10}	$0.0004x_1$	$+0.0088x_2$	$+3.4615x_7$	$+0.2451x_{10}$	1.77	312.5
x_1	x_2	x_8	x_9	$0.0004x_1$	$+0.0088x_2$	$+2.4851x_8$	$+0.0027x_9$	0.35	155.05
x_1	x_2	x_8	x_{10}	$0.0004x_1$	$+0.0088x_2$	$+2.4851x_8$	$+0.2451x_{10}$	1.14	201.22
x_1	x_2	x_9	x_{10}	$0.0004x_1$	$+0.0088x_2$	$+0.0027x_9$	$+0.2451x_{10}$	1.41	248.49
x_1	x_3	x_4	x_5	$0.0004x_1$	$+0.0106x_3$	$+0.0190x_4$	$+0.1507x_5$	0.79	139.34
x_1	x_3	x_4	x_6	$0.0004x_1$	$+0.0106x_3$	$+0.0190x_4$	$+0.5952x_6$	1.38	244.31
x_1	x_3	x_4	x_7	$0.0004x_1$	$+0.0106x_3$	$+0.0190x_4$	$+3.4615x_7$	1.67	294.7
x_1	x_3	x_4	x_8	$0.0004x_1$	$+0.0106x_3$	$+0.0190x_4$	$+2.4851x_8$	0.94	166.58
x_1	x_3	x_4	x_9	$0.0004x_1$	$+0.0106x_3$	$+0.0190x_4$	$+0.0027x_9$	1.28	245.57
x_1	x_3	x_4	x_{10}	$0.0004x_1$	$+0.0106x_3$	$+0.0190x_4$	$+0.2451x_{10}$	1.53	270.68

1				2				3	4
x_1	x_3	x_5	x_6	$0.0004x_1$	$+0.0106x_3$	$+0.1507x_5$	$+0.5952x_6$	1.01	178.2
x_1	x_3	x_5	x_7	$0.0004x_1$	$+0.0106x_3$	$+0.1507x_5$	$+3.4615x_7$	1.33	236.03
x_1	x_3	x_5	x_8	$0.0004x_1$	$+0.0106x_3$	$+0.1507x_5$	$+2.4851x_8$	0.71	126.13
x_1	x_3	x_5	x_9	$0.0004x_1$	$+0.0106x_3$	$+0.1507x_5$	$+0.0027x_9$	0.89	157.05
x_1	x_3	x_5	x_{10}	$0.0004x_1$	$+0.0106x_3$	$+0.1507x_5$	$+0.2451x_{10}$	1.17	207.78
x_1	x_3	x_6	x_7	$0.0004x_1$	$+0.0106x_3$	$+0.5952x_6$	$+3.4615x_7$	1.91	338.08
x_1	x_3	x_6	x_8	$0.0004x_1$	$+0.0106x_3$	$+0.5952x_6$	$+2.4851x_8$	1.13	199.81
x_1	x_3	x_6	x_9	$0.0004x_1$	$+0.0106x_3$	$+0.5952x_6$	$+0.0027x_9$	1.49	263
x_1	x_3	x_6	x_{10}	$0.0004x_1$	$+0.0106x_3$	$+0.5952x_6$	$+0.2451x_{10}$	1.72	304.24
x_1	x_3	x_7	x_8	$0.0004x_1$	$+0.0106x_3$	$+3.4615x_7$	$+2.4851x_8$	1.49	263.54
x_1	x_3	x_7	x_9	$0.0004x_1$	$+0.0106x_3$	$+3.4615x_7$	$+0.0027x_9$	1.77	312.68
x_1	x_3	x_7	x_{10}	$0.0004x_1$	$+0.0106x_3$	$+3.4615x_7$	$+0.2451x_{10}$	1.99	351.89
x_1	x_3	x_8	x_9	$0.0004x_1$	$+0.0106x_3$	$+2.4851x_8$	$+0.0027x_9$	1.02	181.18
x_1	x_3	x_8	x_{10}	$0.0004x_1$	$+0.0106x_3$	$+2.4851x_8$	$+0.2451x_{10}$	0.3	229.44
x_1	x_3	x_9	x_{10}	$0.0004x_1$	$+0.0106x_3$	$+0.0027x_9$	$+0.2451x_{10}$	1.63	287.71
x_1	x_4	x_5	x_6	$0.0004x_1$	$+0.0190x_4$	$+0.1507x_5$	$+0.5952x_6$	0.93	164.31
x_1	x_4	x_5	x_7	$0.0004x_1$	$+0.0190x_4$	$+0.1507x_5$	$+3.4615x_7$	1.26	223.25
x_1	x_4	x_5	x_8	$0.0004x_1$	$+0.0190x_4$	$+0.1507x_5$	$+2.4851x_8$	0.69	121.98
x_1	x_4	x_5	x_9	$0.0004x_1$	$+0.0190x_4$	$+0.1507x_5$	$+0.0027x_9$	0.81	142.98
x_1	x_4	x_5	x_{10}	$0.0004x_1$	$+0.0190x_4$	$+0.1507x_5$	$+0.2451x_{10}$	1.11	196.27
x_1	x_4	x_6	x_7	$0.0004x_1$	$+0.0190x_4$	$+0.5952x_6$	$+3.4615x_7$	1.83	324.32
x_1	x_4	x_6	x_8	$0.0004x_1$	$+0.0190x_4$	$+0.5952x_6$	$+2.4851x_8$	1.07	188.82
x_1	x_4	x_6	x_9	$0.0004x_1$	$+0.0190x_4$	$+0.5952x_6$	$+0.0027x_9$	1.41	248.52
x_1	x_4	x_6	x_{10}	$0.0004x_1$	$+0.0190x_4$	$+0.5952x_6$	$+0.2451x_{10}$	1.65	290.97
x_1	x_4	x_7	x_8	$0.0004x_1$	$+0.0190x_4$	$+3.4615x_7$	$+2.4851x_8$	1.43	253.14
x_1	x_4	x_7	x_9	$0.0004x_1$	$+0.0190x_4$	$+3.4615x_7$	$+0.0027x_9$	1.69	298.82
x_1	x_4	x_7	x_{10}	$0.0004x_1$	$+0.0190x_4$	$+3.4615x_7$	$+0.2451x_{10}$	1.92	238.86
x_1	x_4	x_8	x_9	$0.0004x_1$	$+0.0190x_4$	$+2.4851x_8$	$+0.0027x_9$	0.97	170.77
x_1	x_4	x_8	x_{10}	$0.0004x_1$	$+0.0190x_4$	$+2.4851x_8$	$+0.2451x_{10}$	1.24	220.18
x_1	x_4	x_9	x_{10}	$0.0004x_1$	$+0.0190x_4$	$+0.0027x_9$	$+0.2451x_{10}$	1.55	274.73
x_1	x_5	x_6	x_7	$0.0004x_1$	$+0.1507x_5$	$+0.5952x_6$	$+3.4615x_7$	1.51	267.56

1				2				3	4
x_1	x_5	x_6	x_8	$0.0004x_1$	$+0.1507x_5$	$+0.5952x_6$	$+2.4851x_8$	0.83	146.08
x_1	x_5	x_6	x_9	$0.0004x_1$	$+0.1507x_5$	$+0.5952x_6$	$+0.0027x_9$	1.03	181.96
x_1	x_5	x_6	x_{10}	$0.0004x_1$	$+0.1507x_5$	$+0.5952x_6$	$+0.2451x_{10}$	1.29	228.27
x_1	x_5	x_7	x_8	$0.0004x_1$	$+0.1507x_5$	$+3.4615x_7$	$+2.4851x_8$	1.22	215.74
x_1	x_5	x_7	x_9	$0.0004x_1$	$+0.1507x_5$	$+3.4615x_7$	$+0.0027x_9$	1.35	239.62
x_1	x_5	x_7	x_{10}	$0.0004x_1$	$+0.1507x_5$	$+3.4615x_7$	$+0.2451x_{10}$	1.59	281.15
x_1	x_5	x_8	x_9	$0.0004x_1$	$+0.1507x_5$	$+2.4851x_8$	$+0.0027x_9$	0.73	128.81
x_1	x_5	x_8	x_{10}	$0.0004x_1$	$+0.1507x_5$	$+2.4851x_8$	$+0.2451x_{10}$	1.01	178.82
x_1	x_5	x_9	x_{10}	$0.0004x_1$	$+0.1507x_5$	$+0.0027x_9$	$+0.2451x_{10}$	1.19	211.31
x_1	x_6	x_7	x_8	$0.0004x_1$	$+0.5952x_6$	$+3.4615x_7$	$+2.4851x_8$	1.65	292.69
x_1	x_6	x_7	x_9	$0.0004x_1$	$+0.5952x_6$	$+3.4615x_7$	$+0.0027x_9$	1.93	342.16
x_1	x_6	x_7	x_{10}	$0.0004x_1$	$+0.5952x_6$	$+3.4615x_7$	$+0.2451x_{10}$	2.14	378.85
x_1	x_6	x_8	x_9	$0.0004x_1$	$+0.5952x_6$	$+2.4851x_8$	$+0.0027x_9$	1.15	204.1
x_1	x_6	x_8	x_{10}	$0.0004x_1$	$+0.5952x_6$	$+2.4851x_8$	$+0.2451x_{10}$	1.41	248.82
x_1	x_6	x_9	x_{10}	$0.0004x_1$	$+0.5952x_6$	$+0.0027x_9$	$+0.2451x_{10}$	1.74	308.37
x_1	x_7	x_8	x_9	$0.0004x_1$	$+3.4615x_7$	$+2.4851x_8$	$+0.0027x_9$	1.51	267.49
x_1	x_7	x_8	x_{10}	$0.0004x_1$	$+3.4615x_7$	$+2.4851x_8$	$+0.2451x_{10}$	1.74	307.31
x_1	x_7	x_9	x_{10}	$0.0004x_1$	$+3.4615x_7$	$+0.0027x_9$	$+0.2451x_{10}$	2.01	355.98
x_1	x_8	x_9	x_{10}	$0.0004x_1$	$+2.4851x_8$	$+0.0027x_9$	$+0.2451x_{10}$	1.32	233.45
x_2	x_3	x_4	x_5	$0.0088x_2$	$+0.0106x_3$	$+0.0190x_4$	$+0.1507x_5$	0.34	59.8
x_2	x_3	x_4	x_6	$0.0088x_2$	$+0.0106x_3$	$+0.0190x_4$	$+0.5952x_6$	0.92	162.5
x_2	x_3	x_4	x_7	$0.0088x_2$	$+0.0106x_3$	$+0.0190x_4$	$+3.4615x_7$	1.24	218.8
x_2	x_3	x_4	x_8	$0.0088x_2$	$+0.0106x_3$	$+0.0190x_4$	$+2.4851x_8$	0.57	100.63
x_2	x_3	x_4	x_9	$0.0088x_2$	$+0.0106x_3$	$+0.0190x_4$	$+0.0027x_9$	0.8	142.34
x_2	x_3	x_4	x_{10}	$0.0088x_2$	$+0.0106x_3$	$+0.0190x_4$	$+0.2451x_{10}$	1.01	178.09
x_2	x_3	x_5	x_6	$0.0088x_2$	$+0.0106x_3$	$+0.1507x_5$	$+0.5952x_6$	0.58	102.37
x_2	x_3	x_5	x_7	$0.0088x_2$	$+0.0106x_3$	$+0.1507x_5$	$+3.4615x_7$	0.96	169.54
x_2	x_3	x_5	x_8	$0.0088x_2$	$+0.0106x_3$	$+0.1507x_5$	$+2.4851x_8$	0.57	101.44
x_2	x_3	x_5	x_9	$0.0088x_2$	$+0.0106x_3$	$+0.1507x_5$	$+0.0027x_9$	0.44	77.73
x_2	x_3	x_5	x_{10}	$0.0088x_2$	$+0.0106x_3$	$+0.1507x_5$	$+0.2451x_{10}$	0.66	116.72
x_2	x_3	x_6	x_7	$0.0088x_2$	$+0.0106x_3$	$+0.5952x_6$	$+3.4615x_7$	1.49	264.37

1				2				3	4
x_2	x_3	x_6	x_8	$0.0088x_2$	$+0.0106x_3$	$+0.5952x_6$	$+2.4851x_8$	0.73	129.86
x_2	x_3	x_6	x_9	$0.0088x_2$	$+0.0106x_3$	$+0.5952x_6$	$+0.0027x_9$	1.03	181.95
x_2	x_3	x_6	x_{10}	$0.0088x_2$	$+0.0106x_3$	$+0.5952x_6$	$+0.2451x_{10}$	1.21	213.5
x_2	x_3	x_7	x_8	$0.0088x_2$	$+0.0106x_3$	$+3.4615x_7$	$+2.4851x_8$	1.14	201.75
x_2	x_3	x_7	x_9	$0.0088x_2$	$+0.0106x_3$	$+3.4615x_7$	$+0.0027x_9$	1.34	236.67
x_2	x_3	x_7	x_{10}	$0.0088x_2$	$+0.0106x_3$	$+3.4615x_7$	$+0.2451x_{10}$	1.51	266.74
x_2	x_3	x_8	x_9	$0.0088x_2$	$+0.0106x_3$	$+2.4851x_8$	$+0.0027x_9$	0.63	111.43
x_2	x_3	x_8	x_{10}	$0.0088x_2$	$+0.0106x_3$	$+2.4851x_8$	$+0.2451x_{10}$	0.83	146.01
x_2	x_3	x_9	x_{10}	$0.0088x_2$	$+0.0106x_3$	$+0.0027x_9$	$+0.2451x_{10}$	1.11	196.13
x_2	x_4	x_5	x_6	$0.0088x_2$	$+0.0190x_4$	$+0.1507x_5$	$+0.5952x_6$	0.5	88.05
x_2	x_4	x_5	x_7	$0.0088x_2$	$+0.0190x_4$	$+0.1507x_5$	$+3.4615x_7$	0.89	157.82
x_2	x_4	x_5	x_8	$0.0088x_2$	$+0.0190x_4$	$+0.1507x_5$	$+2.4851x_8$	0.6	106.27
x_2	x_4	x_5	x_9	$0.0088x_2$	$+0.0190x_4$	$+0.1507x_5$	$+0.0027x_9$	0.35	62.18
x_2	x_4	x_5	x_{10}	$0.0088x_2$	$+0.0190x_4$	$+0.1507x_5$	$+0.2451x_{10}$	0.59	104.91
x_2	x_4	x_6	x_7	$0.0088x_2$	$+0.0190x_4$	$+0.5952x_6$	$+3.4615x_7$	1.42	250.61
x_2	x_4	x_6	x_8	$0.0088x_2$	$+0.0190x_4$	$+0.5952x_6$	$+2.4851x_8$	0.68	120.92
x_2	x_4	x_6	x_9	$0.0088x_2$	$+0.0190x_4$	$+0.5952x_6$	$+0.0027x_9$	0.94	166.58
x_2	x_4	x_6	x_{10}	$0.0088x_2$	$+0.0190x_4$	$+0.5952x_6$	$+0.2451x_{10}$	1.13	199.28
x_2	x_4	x_7	x_8	$0.0088x_2$	$+0.0190x_4$	$+3.4615x_7$	$+2.4851x_8$	1.09	193.28
x_2	x_4	x_7	x_9	$0.0088x_2$	$+0.0190x_4$	$+3.4615x_7$	$+0.0027x_9$	1.26	222.68
x_2	x_4	x_7	x_{10}	$0.0088x_2$	$+0.0190x_4$	$+3.4615x_7$	$+0.2451x_{10}$	1.43	253.33
x_2	x_4	x_8	x_9	$0.0088x_2$	$+0.0190x_4$	$+2.4851x_8$	$+0.0027x_9$	0.59	103.94
x_2	x_4	x_8	x_{10}	$0.0088x_2$	$+0.0190x_4$	$+2.4851x_8$	$+0.2451x_{10}$	0.78	138.5
x_2	x_4	x_9	x_{10}	$0.0088x_2$	$+0.0190x_4$	$+0.0027x_9$	$+0.2451x_{10}$	1.03	182.19
x_2	x_5	x_6	x_7	$0.0088x_2$	$+0.1507x_5$	$+0.5952x_6$	$+3.4615x_7$	1.15	203.02
x_2	x_5	x_6	x_8	$0.0088x_2$	$+0.1507x_5$	$+0.5952x_6$	$+2.4851x_8$	0.63	110.98
x_2	x_5	x_6	x_9	$0.0088x_2$	$+0.1507x_5$	$+0.5952x_6$	$+0.0027x_9$	0.6	105.34
x_2	x_5	x_6	x_{10}	$0.0088x_2$	$+0.1507x_5$	$+0.5952x_6$	$+0.2451x_{10}$	0.78	138.4
x_2	x_5	x_7	x_8	$0.0088x_2$	$+0.1507x_5$	$+3.4615x_7$	$+2.4851x_8$	1.01	178.4
x_2	x_5	x_7	x_9	$0.0088x_2$	$+0.1507x_5$	$+3.4615x_7$	$+0.0027x_9$	0.97	172.39
x_2	x_5	x_7	x_{10}	$0.0088x_2$	$+0.1507x_5$	$+3.4615x_7$	$+0.2451x_{10}$	1.14	200.98

1				2				3	4
x_2	x_5	x_8	x_9	$0.0088x_2$	$+0.1507x_5$	$+2.4851x_8$	$+0.0027x_9$	0.57	101.17
x_2	x_5	x_8	x_{10}	$0.0088x_2$	$+0.1507x_5$	$+2.4851x_8$	$+0.2451x_{10}$	0.69	121.15
x_2	x_5	x_9	x_{10}	$0.0088x_2$	$+0.1507x_5$	$+0.0027x_9$	$+0.2451x_{10}$	0.68	119.88
x_2	x_6	x_7	x_8	$0.0088x_2$	$+0.5952x_6$	$+3.4615x_7$	$+2.4851x_8$	1.31	231.31
x_2	x_6	x_7	x_9	$0.0088x_2$	$+0.5952x_6$	$+3.4615x_7$	$+0.0027x_9$	1.52	268.2
x_2	x_6	x_7	x_{10}	$0.0088x_2$	$+0.5952x_6$	$+3.4615x_7$	$+0.2451x_{10}$	1.67	295.71
x_2	x_6	x_8	x_9	$0.0088x_2$	$+0.5952x_6$	$+2.4851x_8$	$+0.0027x_9$	0.76	133.65
x_2	x_6	x_8	x_{10}	$0.0088x_2$	$+0.5952x_6$	$+2.4851x_8$	$+0.2451x_{10}$	0.93	164.86
x_2	x_6	x_9	x_{10}	$0.0088x_2$	$+0.5952x_6$	$+0.0027x_9$	$+0.2451x_{10}$	1.23	217.67
x_2	x_7	x_8	x_9	$0.0088x_2$	$+3.4615x_7$	$+2.4851x_8$	$+0.0027x_9$	1.16	206.15
x_2	x_7	x_8	x_{10}	$0.0088x_2$	$+3.4615x_7$	$+2.4851x_8$	$+0.2451x_{10}$	1.31	232.4
x_2	x_7	x_9	x_{10}	$0.0088x_2$	$+3.4615x_7$	$+0.0027x_9$	$+0.2451x_{10}$	1.53	270.76
x_2	x_8	x_9	x_{10}	$0.0088x_2$	$+2.4851x_8$	$+0.0027x_9$	$+0.2451x_{10}$	0.85	149.82
x_3	x_4	x_5	x_6	$0.0106x_3$	$+0.0190x_4$	$+0.1507x_5$	$+0.5952x_6$	0.73	128.43
x_3	x_4	x_5	x_7	$0.0106x_3$	$+0.0190x_4$	$+0.1507x_5$	$+3.4615x_7$	1.08	190.94
x_3	x_4	x_5	x_8	$0.0106x_3$	$+0.0190x_4$	$+0.1507x_5$	$+2.4851x_8$	0.53	93.91
x_3	x_4	x_5	x_9	$0.0106x_3$	$+0.0190x_4$	$+0.1507x_5$	$+0.0027x_9$	0.58	101.79
x_3	x_4	x_5	x_{10}	$0.0106x_3$	$+0.0190x_4$	$+0.1507x_5$	$+0.2451x_{10}$	0.78	138.69
x_3	x_4	x_6	x_7	$0.0106x_3$	$+0.0190x_4$	$+0.5952x_6$	$+3.4615x_7$	1.66	293.01
x_3	x_4	x_6	x_8	$0.0106x_3$	$+0.0190x_4$	$+0.5952x_6$	$+2.4851x_8$	0.87	153.76
x_3	x_4	x_6	x_9	$0.0106x_3$	$+0.0190x_4$	$+0.5952x_6$	$+0.0027x_9$	1.21	213.76
x_3	x_4	x_6	x_{10}	$0.0106x_3$	$+0.0190x_4$	$+0.5952x_6$	$+0.2451x_{10}$	1.38	243.8
x_3	x_4	x_7	x_8	$0.0106x_3$	$+0.0190x_4$	$+3.4615x_7$	$+2.4851x_8$	1.25	221.78
x_3	x_4	x_7	x_9	$0.0106x_3$	$+0.0190x_4$	$+3.4615x_7$	$+0.0027x_9$	1.5	265.14
x_3	x_4	x_7	x_{10}	$0.0106x_3$	$+0.0190x_4$	$+3.4615x_7$	$+0.2451x_{10}$	1.66	294.46
x_3	x_4	x_8	x_9	$0.0106x_3$	$+0.0190x_4$	$+2.4851x_8$	$+0.0027x_9$	0.75	132.43
x_3	x_4	x_8	x_{10}	$0.0106x_3$	$+0.0190x_4$	$+2.4851x_8$	$+0.2451x_{10}$	0.94	166.4
x_3	x_4	x_9	x_{10}	$0.0106x_3$	$+0.0190x_4$	$+0.0027x_9$	$+0.2451x_{10}$	1.27	225.06
x_3	x_5	x_6	x_7	$0.0106x_3$	$+0.1507x_5$	$+0.5952x_6$	$+3.4615x_7$	1.35	238.6
x_3	x_5	x_6	x_8	$0.0106x_3$	$+0.1507x_5$	$+0.5952x_6$	$+2.4851x_8$	0.67	118.38
x_3	x_5	x_6	x_9	$0.0106x_3$	$+0.1507x_5$	$+0.5952x_6$	$+0.0027x_9$	0.83	147.3

1				2				3	4
X ₃	X ₅	X ₆	X ₁₀	0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	1	177.62
X ₃	X ₅	X ₇	X ₈	0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.08	190.06
X ₃	X ₅	X ₇	X ₉	0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.17	207.55
X ₃	X ₅	X ₇	X ₁₀	0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.33	235.83
X ₃	X ₅	X ₈	X ₉	0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	0.55	98.03
X ₃	X ₅	X ₈	X ₁₀	0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	0.71	126.06
X ₃	X ₅	X ₉	X ₁₀	0.0106x ₃	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	0.88	156.44
X ₃	X ₆	X ₇	X ₈	0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.49	263.6
X ₃	X ₆	X ₇	X ₉	0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.76	311.02
X ₃	X ₆	X ₇	X ₁₀	0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.91	337.84
X ₃	X ₆	X ₈	X ₉	0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	0.96	169.31
X ₃	X ₆	X ₈	X ₁₀	0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.13	199.59
X ₃	X ₆	X ₉	X ₁₀	0.0106x ₃	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.48	262.51
X ₃	X ₇	X ₈	X ₉	0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.33	235.9
X ₃	X ₇	X ₈	X ₁₀	0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.49	263.59
X ₃	X ₇	X ₉	X ₁₀	0.0106x ₃	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.77	312.43
X ₃	X ₈	X ₉	X ₁₀	0.0106x ₃	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.02	180.99
X ₄	X ₅	X ₆	X ₇	0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	1.28	225.76
X ₄	X ₅	X ₆	X ₈	0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	0.64	113.54
X ₄	X ₅	X ₆	X ₉	0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	0.75	131.89
X ₄	X ₅	X ₆	X ₁₀	0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	0.93	163.72
X ₄	X ₅	X ₇	X ₈	0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.04	184.7
X ₄	X ₅	X ₇	X ₉	0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.1	194.21
X ₄	X ₅	X ₇	X ₁₀	0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.26	223.06
X ₄	X ₅	X ₈	X ₉	0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	0.54	95.13
X ₄	X ₅	X ₈	X ₁₀	0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	0.69	121.95
X ₄	X ₅	X ₉	X ₁₀	0.0190x ₄	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	0.8	142.36
X ₄	X ₆	X ₇	X ₈	0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.43	253.02
X ₄	X ₆	X ₇	X ₉	0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.68	296.95
X ₄	X ₆	X ₇	X ₁₀	0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.83	324.09
X ₄	X ₆	X ₈	X ₉	0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	0.89	157.88

1					2					3	4
X ₄	X ₆	X ₈	X ₁₀		0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀		1.07	188.63
X ₄	X ₆	X ₉	X ₁₀		0.0190x ₄	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀		1.4	248.03
X ₄	X ₇	X ₈	X ₉		0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉		1.27	225.47
X ₄	X ₇	X ₈	X ₁₀		0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		1.43	253.21
X ₄	X ₇	X ₉	X ₁₀		0.0190x ₄	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		1.69	298.59
X ₄	X ₈	X ₉	X ₁₀		0.0190x ₄	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		0.96	176.01
X ₅	X ₆	X ₇	X ₈		0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈		1.25	220.71
X ₅	X ₆	X ₇	X ₉		0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉		1.37	241.9
X ₅	X ₆	X ₇	X ₁₀		0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀		1.51	267.35
X ₅	X ₆	X ₈	X ₉		0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉		0.68	120.71
X ₅	X ₆	X ₈	X ₁₀		0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀		0.83	148.97
X ₅	X ₆	X ₉	X ₁₀		0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀		1.03	181.4
X ₅	X ₇	X ₈	X ₉		0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉		1.09	193.03
X ₅	X ₇	X ₈	X ₁₀		0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		1.22	215.92
X ₅	X ₇	X ₉	X ₁₀		0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		1.35	239.42
X ₅	X ₈	X ₉	X ₁₀		0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		0.73	128.74
X ₆	X ₇	X ₈	X ₉		0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉		1.51	267.33
X ₆	X ₇	X ₈	X ₁₀		0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		1.66	292.7
X ₆	X ₇	X ₉	X ₁₀		0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		1.93	341.92
X ₆	X ₈	X ₉	X ₁₀		0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.15	203.9
X ₇	X ₈	X ₉	X ₁₀		3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.51	267.54
X ₁	X ₂	X ₃	X ₄	X ₅	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	0.82	144.45
X ₁	X ₂	X ₃	X ₄	X ₆	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	1.39	246.69
X ₁	X ₂	X ₃	X ₄	X ₇	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	1.68	296.65
X ₁	X ₂	X ₃	X ₄	X ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+2.4851x ₈	0.96	170.5
X ₁	X ₂	X ₃	X ₄	X ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.0027x ₉	1.3	229.41
X ₁	X ₂	X ₃	X ₄	X ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.2451x ₁₀	1.55	274.71
X ₁	X ₂	X ₃	X ₅	X ₆	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	1.02	181.12
X ₁	X ₂	X ₃	X ₅	X ₇	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	1.35	237.97
X ₁	X ₂	X ₃	X ₅	X ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+2.4851x ₈	0.74	130.81
X ₁	X ₂	X ₃	X ₅	X ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.0027x ₉	0.92	162.16

1					2					3	4
x ₁	x ₂	x ₃	x ₅	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.2451x ₁₀	1.2	212.73
x ₁	x ₂	x ₃	x ₆	x ₇	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	1.92	339.02
x ₁	x ₂	x ₃	x ₆	x ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+2.4851x ₈	1.14	202.09
x ₁	x ₂	x ₃	x ₆	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+0.0027x ₉	1.5	265.55
x ₁	x ₂	x ₃	x ₆	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+0.2451x ₁₀	1.74	307.19
x ₁	x ₂	x ₃	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+3.4615x ₇	+2.4851x ₈	1.5	265.03
x ₁	x ₂	x ₃	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+3.4615x ₇	+0.0027x ₉	1.78	314.62
x ₁	x ₂	x ₃	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+3.4615x ₇	+0.2451x ₁₀	2	354.25
x ₁	x ₂	x ₃	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+2.4851x ₈	+0.0027x ₉	1.05	185.29
x ₁	x ₂	x ₃	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+2.4851x ₈	+0.2451x ₁₀	1.32	233.66
x ₁	x ₂	x ₃	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0027x ₉	+0.2451x ₁₀	1.65	291.82
x ₁	x ₂	x ₄	x ₅	x ₆	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	0.94	166.99
x ₁	x ₂	x ₄	x ₅	x ₇	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	1.27	224.94
x ₁	x ₂	x ₄	x ₅	x ₈	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	0.71	126.17
x ₁	x ₂	x ₄	x ₅	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.0027x ₉	0.84	148
x ₁	x ₂	x ₄	x ₅	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.2451x ₁₀	1.14	201.1
x ₁	x ₂	x ₄	x ₆	x ₇	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	1.84	225.04
x ₁	x ₂	x ₄	x ₆	x ₈	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	1.08	190.8
x ₁	x ₂	x ₄	x ₆	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+0.0027x ₉	1.42	250.89
x ₁	x ₂	x ₄	x ₆	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+0.2451x ₁₀	1.66	293.77
x ₁	x ₂	x ₄	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	1.44	254.36
x ₁	x ₂	x ₄	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+3.4615x ₇	+0.0027x ₉	1.7	300.57
x ₁	x ₂	x ₄	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+3.4615x ₇	+0.2451x ₁₀	1.93	341.07
x ₁	x ₂	x ₄	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+2.4851x ₈	+0.0027x ₉	0.99	174.64
x ₁	x ₂	x ₄	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+2.4851x ₈	+0.2451x ₁₀	1.27	224.2
x ₁	x ₂	x ₄	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.0027x ₉	+0.2451x ₁₀	1.58	278.73
x ₁	x ₂	x ₅	x ₆	x ₇	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	1.52	268.22
x ₁	x ₂	x ₅	x ₆	x ₈	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	0.84	148.25
x ₁	x ₂	x ₅	x ₆	x ₉	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	1.05	184.85
x ₁	x ₂	x ₅	x ₆	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	1.31	231.57
x ₁	x ₂	x ₅	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.23	216.91

1					2					3	4
x ₁	x ₂	x ₅	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.37	241.56
x ₁	x ₂	x ₅	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.6	283.6
x ₁	x ₂	x ₅	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	0.75	133.45
x ₁	x ₂	x ₅	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	1.04	183.43
x ₁	x ₂	x ₅	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	1.22	216.22
x ₁	x ₂	x ₆	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.66	293.06
x ₁	x ₂	x ₆	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.94	343.11
x ₁	x ₂	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2.15	380.3
x ₁	x ₂	x ₆	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	1.17	206.38
x ₁	x ₂	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.44	251.59
x ₁	x ₂	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.76	311.3
x ₁	x ₂	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.52	268.99
x ₁	x ₂	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.75	309.34
x ₁	x ₂	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.03	358.34
x ₁	x ₂	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.34	237.64
x ₁	x ₃	x ₄	x ₅	x ₆	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	1.18	209.07
x ₁	x ₃	x ₄	x ₅	x ₇	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	1.49	263.12
x ₁	x ₃	x ₄	x ₅	x ₈	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	0.81	143.28
x ₁	x ₃	x ₄	x ₅	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.0027x ₉	1.07	188.42
x ₁	x ₃	x ₄	x ₅	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.2451x ₁₀	1.34	236.12
x ₁	x ₃	x ₄	x ₆	x ₇	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	2.08	368.49
x ₁	x ₃	x ₄	x ₆	x ₈	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	1.3	229.15
x ₁	x ₃	x ₄	x ₆	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+0.0027x ₉	1.68	296.62
x ₁	x ₃	x ₄	x ₆	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+0.2451x ₁₀	1.9	336.32
x ₁	x ₃	x ₄	x ₇	x ₈	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	1.64	289.16
x ₁	x ₃	x ₄	x ₇	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+0.0027x ₉	1.94	343.72
x ₁	x ₃	x ₄	x ₇	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+0.2451x ₁₀	2.16	382.02
x ₁	x ₃	x ₄	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+2.4851x ₈	+0.0027x ₉	1.19	210.54
x ₁	x ₃	x ₄	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+2.4851x ₈	+0.2451x ₁₀	1.45	256.63
x ₁	x ₃	x ₄	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.0027x ₉	+0.2451x ₁₀	1.81	319.75
x ₁	x ₃	x ₅	x ₆	x ₇	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	1.74	307.8

1					2					3	4
x ₁	x ₃	x ₅	x ₆	x ₈	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	0.99	175.37
x ₁	x ₃	x ₅	x ₆	x ₉	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	1.29	227.75
x ₁	x ₃	x ₅	x ₆	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	1.53	270.37
x ₁	x ₃	x ₅	x ₇	x ₈	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.37	242.19
x ₁	x ₃	x ₅	x ₇	x ₉	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.59	280.73
x ₁	x ₃	x ₅	x ₇	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.81	320.52
x ₁	x ₃	x ₅	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	0.88	155.83
x ₁	x ₃	x ₅	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	1.16	204.79
x ₁	x ₃	x ₅	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	1.43	252.86
x ₁	x ₃	x ₆	x ₇	x ₈	0.0004x ₁	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.87	330.07
x ₁	x ₃	x ₆	x ₇	x ₉	0.0004x ₁	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	2.19	386.81
x ₁	x ₃	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2.39	422.38
x ₁	x ₃	x ₆	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	1.39	245.97
x ₁	x ₃	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.63	288.16
x ₁	x ₃	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	2	354.3
x ₁	x ₃	x ₇	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.72	305.03
x ₁	x ₃	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.94	343.87
x ₁	x ₃	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.26	399.75
x ₁	x ₃	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.54	271.79
x ₁	x ₄	x ₅	x ₆	x ₇	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	1.66	294.25
x ₁	x ₄	x ₅	x ₆	x ₈	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	0.94	165.66
x ₁	x ₄	x ₅	x ₆	x ₉	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	1.2	212.98
x ₁	x ₄	x ₅	x ₆	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	1.45	257.23
x ₁	x ₄	x ₅	x ₇	x ₈	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.32	232.86
x ₁	x ₄	x ₅	x ₇	x ₉	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.51	266.91
x ₁	x ₄	x ₅	x ₇	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.74	307.07
x ₁	x ₄	x ₅	x ₈	x ₉	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	0.83	146.68
x ₁	x ₄	x ₅	x ₈	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	1.11	196.8
x ₁	x ₄	x ₅	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	1.36	239.86
x ₁	x ₄	x ₆	x ₇	x ₈	0.0004x ₁	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.8	318.25
x ₁	x ₄	x ₆	x ₇	x ₉	0.0004x ₁	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	2.11	372.64

1					2					3	4
x ₁	x ₄	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2.31	408.79
x ₁	x ₄	x ₆	x ₈	x ₉	0.0004x ₁	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	1.32	233.55
x ₁	x ₄	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.56	276.75
x ₁	x ₄	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.93	340.5
x ₁	x ₄	x ₇	x ₈	x ₉	0.0004x ₁	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.66	293.28
x ₁	x ₄	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.88	332.69
x ₁	x ₄	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.18	386.18
x ₁	x ₄	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.47	260.81
x ₁	x ₅	x ₆	x ₇	x ₈	0.0004x ₁	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.54	271.76
x ₁	x ₅	x ₆	x ₇	x ₉	0.0004x ₁	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.76	311.57
x ₁	x ₅	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.97	348.48
x ₁	x ₅	x ₆	x ₈	x ₉	0.0004x ₁	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	1.01	179.07
x ₁	x ₅	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.27	224.05
x ₁	x ₅	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.55	274.24
x ₁	x ₅	x ₇	x ₈	x ₉	0.0004x ₁	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.39	245.59
x ₁	x ₅	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.61	284.74
x ₁	x ₅	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.83	324.33
x ₁	x ₅	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.18	208.26
x ₁	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.89	334.18
x ₁	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.1	370.51
x ₁	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.41	426.53
x ₁	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.65	292.44
x ₁	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.97	347.98
x ₂	x ₃	x ₄	x ₅	x ₆	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	0.73	129.92
x ₂	x ₃	x ₄	x ₅	x ₇	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	1.08	198.59
x ₂	x ₃	x ₄	x ₅	x ₈	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	0.55	96.72
x ₂	x ₃	x ₄	x ₅	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.0027x ₉	0.6	106.42
x ₂	x ₃	x ₄	x ₅	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.2451x ₁₀	0.81	143.71
x ₂	x ₃	x ₄	x ₆	x ₇	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	1.66	292.96
x ₂	x ₃	x ₄	x ₆	x ₈	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	0.87	154.58
x ₂	x ₃	x ₄	x ₆	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+0.0027x ₉	1.22	215.34

1					2					3	4
x ₂	x ₃	x ₄	x ₆	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+0.2451x ₁₀	1.39	246.12
x ₂	x ₃	x ₄	x ₇	x ₈	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	1.26	222.05
x ₂	x ₃	x ₄	x ₇	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+0.0027x ₉	1.51	266.17
x ₂	x ₃	x ₄	x ₇	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+0.2451x ₁₀	1.67	296.15
x ₂	x ₃	x ₄	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+2.4851x ₈	+0.0027x ₉	0.77	135.54
x ₂	x ₃	x ₄	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+2.4851x ₈	+0.2451x ₁₀	0.96	170.26
x ₂	x ₃	x ₄	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.0027x ₉	+0.2451x ₁₀	1.29	228.83
x ₂	x ₃	x ₅	x ₆	x ₇	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	1.35	238.25
x ₂	x ₃	x ₅	x ₆	x ₈	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	0.67	118.93
x ₂	x ₃	x ₅	x ₆	x ₉	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	0.84	149.19
x ₂	x ₃	x ₅	x ₆	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	1.02	184.45
x ₂	x ₃	x ₅	x ₇	x ₈	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.08	190.66
x ₂	x ₃	x ₅	x ₇	x ₉	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.18	208.59
x ₂	x ₃	x ₅	x ₇	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.34	237.69
x ₂	x ₃	x ₅	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	0.57	101.62
x ₂	x ₃	x ₅	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	0.74	130.61
x ₂	x ₃	x ₅	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	0.91	161.46
x ₂	x ₃	x ₆	x ₇	x ₈	0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.49	263.07
x ₂	x ₃	x ₆	x ₇	x ₉	0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.76	311.26
x ₂	x ₃	x ₆	x ₇	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.92	338.72
x ₂	x ₃	x ₆	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	0.96	170.58
x ₂	x ₃	x ₆	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.14	201.8
x ₂	x ₃	x ₆	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.5	265
x ₂	x ₃	x ₇	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.34	236.55
x ₂	x ₃	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.5	265.01
x ₂	x ₃	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.78	314.33
x ₂	x ₃	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.05	185.01
x ₂	x ₄	x ₅	x ₆	x ₇	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	1.27	225.07
x ₂	x ₄	x ₅	x ₆	x ₈	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	0.64	113.41
x ₂	x ₄	x ₅	x ₆	x ₉	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	0.75	133.39
x ₂	x ₄	x ₅	x ₆	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	0.94	166.31

1					2					3	4
x ₂	x ₄	x ₅	x ₇	x ₈	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.04	184.27
x ₂	x ₄	x ₅	x ₇	x ₉	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.1	194.89
x ₂	x ₄	x ₅	x ₇	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.27	224.67
x ₂	x ₄	x ₅	x ₈	x ₉	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	0.55	97.99
x ₂	x ₄	x ₅	x ₈	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	0.71	126.01
x ₂	x ₄	x ₅	x ₉	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	0.83	147.3
x ₂	x ₄	x ₆	x ₇	x ₈	0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.43	251.13
x ₂	x ₄	x ₆	x ₇	x ₉	0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.68	296.92
x ₂	x ₄	x ₆	x ₇	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.84	324.76
x ₂	x ₄	x ₆	x ₈	x ₉	0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	0.9	158.73
x ₂	x ₄	x ₆	x ₈	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.08	190.53
x ₂	x ₄	x ₆	x ₉	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.42	250.34
x ₂	x ₄	x ₇	x ₈	x ₉	0.0088x ₂	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.28	225.77
x ₂	x ₄	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.44	254.37
x ₂	x ₄	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.0190x ₄	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.7	300.28
x ₂	x ₄	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0190x ₄	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	0.99	174.38
x ₂	x ₅	x ₆	x ₇	x ₈	0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.24	219.43
x ₂	x ₅	x ₆	x ₇	x ₉	0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.37	241.62
x ₂	x ₅	x ₆	x ₇	x ₁₀	0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.52	267.95
x ₂	x ₅	x ₆	x ₈	x ₉	0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	0.69	121.32
x ₂	x ₅	x ₆	x ₈	x ₁₀	0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	0.84	148.03
x ₂	x ₅	x ₆	x ₉	x ₁₀	0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.04	184.21
x ₂	x ₅	x ₇	x ₈	x ₉	0.0088x ₂	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.09	193.07
x ₂	x ₅	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.23	217.01
x ₂	x ₅	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.36	241.29
x ₂	x ₅	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	0.75	133.26
x ₂	x ₆	x ₇	x ₈	x ₉	0.0088x ₂	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.51	266.83
x ₂	x ₆	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.66	293.02
x ₂	x ₆	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.94	342.82
x ₂	x ₆	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.17	206.1
x ₃	x ₄	x ₅	x ₆	x ₇	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	1.52	268.97

1					2					3	4
X ₃	X ₄	X ₅	X ₆	X ₈	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	1.49	264.2
X ₃	X ₄	X ₅	X ₆	X ₉	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	0.76	134.1
X ₃	X ₄	X ₅	X ₆	X ₁₀	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	1.01	178.52
X ₃	X ₄	X ₅	X ₇	X ₈	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.18	208.52
X ₃	X ₄	X ₅	X ₇	X ₉	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.16	204.66
X ₃	X ₄	X ₅	X ₇	X ₁₀	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.32	234.14
X ₃	X ₄	X ₅	X ₈	X ₉	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	1.49	262.89
X ₃	X ₄	X ₅	X ₈	X ₁₀	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	0.63	111.68
X ₃	X ₄	X ₅	X ₉	X ₁₀	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	0.81	143.14
X ₃	X ₄	X ₆	X ₇	X ₈	0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.06	187.85
X ₃	X ₄	X ₆	X ₇	X ₉	0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.63	288.09
X ₃	X ₄	X ₆	X ₇	X ₁₀	0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.93	341.26
X ₃	X ₄	X ₆	X ₈	X ₉	0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	2.08	368.24
X ₃	X ₄	X ₆	X ₈	X ₁₀	0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.12	198.78
X ₃	X ₄	X ₆	X ₉	X ₁₀	0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.29	228.92
X ₃	X ₄	X ₇	X ₈	X ₉	0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.67	296.15
X ₃	X ₄	X ₇	X ₈	X ₁₀	0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.48	260.89
X ₃	X ₄	X ₇	X ₉	X ₁₀	0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.64	289.16
X ₃	X ₄	X ₈	X ₉	X ₁₀	0.0106x ₃	+0.0190x ₄	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.94	343.47
X ₃	X ₅	X ₆	X ₇	X ₈	0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.19	210.33
X ₃	X ₅	X ₆	X ₇	X ₉	0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.39	245.45
X ₃	X ₅	X ₆	X ₇	X ₁₀	0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.59	281.68
X ₃	X ₅	X ₆	X ₈	X ₉	0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	1.74	307.56
X ₃	X ₅	X ₆	X ₈	X ₁₀	0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	0.83	147.28
X ₃	X ₅	X ₆	X ₉	X ₁₀	0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	0.99	175.18
X ₃	X ₅	X ₇	X ₈	X ₉	0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.28	227.22
X ₃	X ₅	X ₇	X ₈	X ₁₀	0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.23	216.83
X ₃	X ₅	X ₇	X ₉	X ₁₀	0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.37	242.27
X ₃	X ₅	X ₈	X ₉	X ₁₀	0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.59	280.49
X ₃	X ₆	X ₇	X ₈	X ₉	0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	0.88	158.67
X ₃	X ₆	X ₇	X ₈	X ₁₀	0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.72	303.95

1						2						3	4
X ₃	X ₆	X ₇	X ₉	X ₁₀		0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		1.87	330.03
X ₃	X ₆	X ₈	X ₉	X ₁₀		0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.19	386.56
X ₃	X ₇	X ₈	X ₉	X ₁₀		0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.29	245.73
X ₄	X ₅	X ₆	X ₇	X ₈		0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈		1.72	309.01
X ₄	X ₅	X ₆	X ₇	X ₉		0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉		1.33	236.06
X ₄	X ₅	X ₆	X ₇	X ₁₀		0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀		1.51	267.74
X ₄	X ₅	X ₆	X ₈	X ₉		0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉		1.66	294.02
X ₄	X ₅	X ₆	X ₈	X ₁₀		0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀		0.78	137.26
X ₄	X ₅	X ₆	X ₉	X ₁₀		0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀		0.94	165.49
X ₄	X ₅	X ₇	X ₈	X ₉		0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉		1.2	212.45
X ₄	X ₅	X ₇	X ₈	X ₁₀		0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		1.17	207.6
X ₄	X ₅	X ₇	X ₉	X ₁₀		0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		1.32	232.97
X ₄	X ₅	X ₈	X ₉	X ₁₀		0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.51	266.69
X ₄	X ₆	X ₇	X ₈	X ₉		0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉		0.83	146.55
X ₄	X ₆	X ₇	X ₈	X ₁₀		0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		1.65	292.01
X ₄	X ₆	X ₇	X ₉	X ₁₀		0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		1.8	218.23
X ₄	X ₆	X ₈	X ₉	X ₁₀		0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.11	372.39
X ₄	X ₇	X ₈	X ₉	X ₁₀		0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.32	233.33
X ₅	X ₆	X ₇	X ₈	X ₉		0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉		1.66	293.28
X ₅	X ₆	X ₇	X ₈	X ₁₀		0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		1.41	248.57
X ₅	X ₆	X ₇	X ₉	X ₁₀		0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		1.54	271.82
X ₅	X ₆	X ₈	X ₉	X ₁₀		0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.76	311.34
X ₅	X ₇	X ₈	X ₉	X ₁₀		0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.01	178.89
X ₆	X ₇	X ₈	X ₉	X ₁₀		0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.39	245.68
X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	1.89	334.14
X ₁	X ₂	X ₃	X ₄	X ₅	X ₇	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	1.2	211.49
X ₁	X ₂	X ₃	X ₄	X ₅	X ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	1.5	264.8
X ₁	X ₂	X ₃	X ₄	X ₅	X ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.0027x ₉	0.83	147.32
X ₁	X ₂	X ₃	X ₄	X ₅	X ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.2451x ₁₀	1.09	192.61
X ₁	X ₂	X ₃	X ₄	X ₆	X ₇	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	1.36	240.43
X ₁	X ₂	X ₃	X ₄	X ₆	X ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	2.09	369.31

1						2						3	4
x ₁	x ₂	x ₃	x ₄	x ₆	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+0.0027x ₉	1.31	231.09
x ₁	x ₂	x ₃	x ₄	x ₆	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+0.2451x ₁₀	1.69	298.83
x ₁	x ₂	x ₃	x ₄	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	1.92	338.94
x ₁	x ₂	x ₃	x ₄	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+0.0027x ₉	1.64	290.46
x ₁	x ₂	x ₃	x ₄	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+0.2451x ₁₀	1.95	345.44
x ₁	x ₂	x ₃	x ₄	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+2.4851x ₈	+0.0027x ₉	2.17	384.16
x ₁	x ₂	x ₃	x ₄	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+2.4851x ₈	+0.2451x ₁₀	1.21	214
x ₁	x ₂	x ₃	x ₄	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.0027x ₉	+0.2451x ₁₀	1.47	260.35
x ₁	x ₂	x ₃	x ₅	x ₆	x ₇	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	1.83	323.4
x ₁	x ₂	x ₃	x ₅	x ₆	x ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	1.74	308.58
x ₁	x ₂	x ₃	x ₅	x ₆	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	1	177.55
x ₁	x ₂	x ₃	x ₅	x ₆	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	1.3	230.36
x ₁	x ₂	x ₃	x ₅	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.55	273.41
x ₁	x ₂	x ₃	x ₅	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.38	243.5
x ₁	x ₂	x ₃	x ₅	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.6	282.63
x ₁	x ₂	x ₃	x ₅	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	1.83	322.88
x ₁	x ₂	x ₃	x ₅	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	0.91	160.12
x ₁	x ₂	x ₃	x ₅	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	1.18	209.15
x ₁	x ₂	x ₃	x ₆	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.45	257.24
x ₁	x ₂	x ₃	x ₆	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.87	330.61
x ₁	x ₂	x ₃	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2.18	387.83
x ₁	x ₂	x ₃	x ₆	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	2.4	423.84
x ₁	x ₂	x ₃	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.4	248.13
x ₁	x ₂	x ₃	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.64	290.79
x ₁	x ₂	x ₃	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	2.02	357.04
x ₁	x ₂	x ₃	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.73	306.57
x ₁	x ₂	x ₃	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.96	345.88
x ₁	x ₂	x ₃	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.27	402.02
x ₁	x ₂	x ₄	x ₅	x ₆	x ₇	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	1.56	275.64
x ₁	x ₂	x ₄	x ₅	x ₆	x ₈	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	1.67	294.8
x ₁	x ₂	x ₄	x ₅	x ₆	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	0.95	167.48

1						2						3	4
x ₁	x ₂	x ₄	x ₅	x ₆	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	1.22	215.4
x ₁	x ₂	x ₄	x ₅	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.47	260.1
x ₁	x ₂	x ₄	x ₅	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.32	233.88
x ₁	x ₂	x ₄	x ₅	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.52	268.6
x ₁	x ₂	x ₄	x ₅	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	1.75	309.9
x ₁	x ₂	x ₄	x ₅	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	0.85	150.67
x ₁	x ₂	x ₄	x ₅	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	1.14	200.93
x ₁	x ₂	x ₄	x ₆	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.38	244.14
x ₁	x ₂	x ₄	x ₆	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.8	318.55
x ₁	x ₂	x ₄	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2.11	373.47
x ₁	x ₂	x ₄	x ₆	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	2.32	410.1
x ₁	x ₂	x ₄	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.33	235.48
x ₁	x ₂	x ₄	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.58	279.19
x ₁	x ₂	x ₄	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.94	343.11
x ₁	x ₂	x ₄	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.67	294.59
x ₁	x ₂	x ₄	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.89	334.53
x ₁	x ₂	x ₄	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.2	388.32
x ₁	x ₂	x ₅	x ₆	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.5	264.5
x ₁	x ₂	x ₅	x ₆	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.54	271.9
x ₁	x ₂	x ₅	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.77	312.37
x ₁	x ₂	x ₅	x ₆	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	1.98	349.85
x ₁	x ₂	x ₅	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.02	181.25
x ₁	x ₂	x ₅	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.28	226.81
x ₁	x ₂	x ₅	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.57	277.26
x ₁	x ₂	x ₅	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.4	246.92
x ₁	x ₂	x ₅	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.96	286.68
x ₁	x ₂	x ₅	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.85	326.69
x ₁	x ₂	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.2	212.59
x ₁	x ₂	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.89	334.74
x ₁	x ₂	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.1	371.62
x ₁	x ₂	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.42	428

1						2						3	4
x ₁	x ₂	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.67	295.06
x ₁	x ₃	x ₄	x ₅	x ₆	x ₇	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	1.98	350
x ₁	x ₃	x ₄	x ₅	x ₆	x ₈	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	1.9	336.35
x ₁	x ₃	x ₄	x ₅	x ₆	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	1.13	200.63
x ₁	x ₃	x ₄	x ₅	x ₆	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	1.47	259.94
x ₁	x ₃	x ₄	x ₅	x ₇	x ₈	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.7	300.93
x ₁	x ₃	x ₄	x ₅	x ₇	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.49	264.04
x ₁	x ₃	x ₄	x ₅	x ₇	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.75	309.96
x ₁	x ₃	x ₄	x ₅	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	1.97	348.94
x ₁	x ₃	x ₄	x ₅	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	1.02	180.74
x ₁	x ₃	x ₄	x ₅	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	1.29	228.18
x ₁	x ₃	x ₄	x ₆	x ₇	x ₈	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.6	283.34
x ₁	x ₃	x ₄	x ₆	x ₇	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	2.02	357.75
x ₁	x ₃	x ₄	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2.36	418.17
x ₁	x ₃	x ₄	x ₆	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	2.56	453.21
x ₁	x ₃	x ₄	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.57	277.24
x ₁	x ₃	x ₄	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.8	318.01
x ₁	x ₃	x ₄	x ₇	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	2.19	387.11
x ₁	x ₃	x ₄	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.88	333.12
x ₁	x ₃	x ₄	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.1	371.36
x ₁	x ₃	x ₄	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.44	430.91
x ₁	x ₃	x ₅	x ₆	x ₇	x ₈	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.7	301.46
x ₁	x ₃	x ₅	x ₆	x ₇	x ₉	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.73	305.14
x ₁	x ₃	x ₅	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2	354.44
x ₁	x ₃	x ₅	x ₆	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	2.21	390.22
x ₁	x ₃	x ₅	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.22	216.63
x ₁	x ₃	x ₅	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.47	259.42
x ₁	x ₃	x ₅	x ₇	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.8	318.83
x ₁	x ₃	x ₅	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.58	278.94
x ₁	x ₃	x ₅	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.8	317.6
x ₁	x ₃	x ₅	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.07	366.43

1						2						3	4
x ₁	x ₃	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.37	242.39
x ₁	x ₃	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.12	374.61
x ₁	x ₃	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.32	410.18
x ₁	x ₃	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.67	471.34
x ₁	x ₃	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.89	334.74
x ₁	x ₄	x ₅	x ₆	x ₇	x ₈	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	2.19	387.64
x ₁	x ₄	x ₅	x ₆	x ₇	x ₉	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.66	293.93
x ₁	x ₄	x ₅	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.92	340.25
x ₁	x ₄	x ₅	x ₆	x ₈	x ₉	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	2.13	376.74
x ₁	x ₄	x ₅	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.16	204.61
x ₁	x ₄	x ₅	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.41	248.6
x ₁	x ₄	x ₅	x ₇	x ₈	x ₉	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.72	304.9
x ₁	x ₄	x ₅	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.51	267.74
x ₁	x ₄	x ₅	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.74	307.02
x ₁	x ₄	x ₅	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2	352.87
x ₁	x ₄	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.31	231.95
x ₁	x ₄	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.05	361.95
x ₁	x ₄	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.25	398
x ₁	x ₄	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.59	457.4
x ₁	x ₄	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.82	322.36
x ₁	x ₅	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	2.12	375.57
x ₁	x ₅	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.75	308.37
x ₁	x ₅	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.95	344.82
x ₁	x ₅	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.23	394.16
x ₁	x ₅	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.49	263.36
x ₁	x ₆	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.82	321.38
x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	2.34	414.4
x ₂	x ₃	x ₄	x ₅	x ₆	x ₈	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	1.49	263.85
x ₂	x ₃	x ₄	x ₅	x ₆	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	0.76	134.49
x ₂	x ₃	x ₄	x ₅	x ₆	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	1.02	180
x ₂	x ₃	x ₄	x ₅	x ₇	x ₈	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.19	210.87

1						2						3	4
x ₂	x ₃	x ₄	x ₅	x ₇	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.16	204.59
x ₂	x ₃	x ₄	x ₅	x ₇	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.33	234.99
x ₂	x ₃	x ₄	x ₅	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	1.5	264.51
x ₂	x ₃	x ₄	x ₅	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	0.65	114.7
x ₂	x ₃	x ₄	x ₅	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	0.83	147.07
x ₂	x ₃	x ₄	x ₆	x ₇	x ₈	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.09	191.97
x ₂	x ₃	x ₄	x ₆	x ₇	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.63	287.55
x ₂	x ₃	x ₄	x ₆	x ₇	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.93	341.43
x ₂	x ₃	x ₄	x ₆	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	2.09	369.01
x ₂	x ₃	x ₄	x ₆	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.13	199.78
x ₂	x ₃	x ₄	x ₆	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.3	230.78
x ₂	x ₃	x ₄	x ₇	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.69	298.31
x ₂	x ₃	x ₄	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.48	261.4
x ₂	x ₃	x ₄	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.95	345.14
x ₂	x ₃	x ₄	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.21	213.71
x ₂	x ₃	x ₅	x ₆	x ₇	x ₈	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.38	244.57
x ₂	x ₃	x ₅	x ₆	x ₇	x ₉	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.59	281.67
x ₂	x ₃	x ₅	x ₆	x ₇	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.74	308.29
x ₂	x ₃	x ₅	x ₆	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	0.84	148.24
x ₂	x ₃	x ₅	x ₆	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1	177.27
x ₂	x ₃	x ₅	x ₆	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.3	229.77
x ₂	x ₃	x ₅	x ₇	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.23	217.18
x ₂	x ₃	x ₅	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.38	243.51
x ₂	x ₃	x ₅	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.6	282.33
x ₂	x ₃	x ₅	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	0.9	159.85
x ₂	x ₃	x ₆	x ₇	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.72	303.73
x ₂	x ₃	x ₆	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.87	330.5
x ₂	x ₃	x ₆	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.19	387.53
x ₂	x ₃	x ₆	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.4	247.83
x ₂	x ₃	x ₇	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.73	306.49
x ₂	x ₄	x ₅	x ₆	x ₇	x ₈	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.33	234.8

1						2						3	4
x ₂	x ₄	x ₅	x ₆	x ₇	x ₉	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.51	267.43
x ₂	x ₄	x ₅	x ₆	x ₇	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.67	294.51
x ₂	x ₄	x ₅	x ₆	x ₈	x ₉	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	0.78	137.69
x ₂	x ₄	x ₅	x ₆	x ₈	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	0.95	167.22
x ₂	x ₄	x ₅	x ₆	x ₉	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.21	214.79
x ₂	x ₄	x ₅	x ₇	x ₈	x ₉	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.17	207.58
x ₂	x ₄	x ₅	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.32	233.92
x ₂	x ₄	x ₅	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.52	268.31
x ₂	x ₄	x ₅	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	0.85	150.43
x ₂	x ₄	x ₆	x ₇	x ₈	x ₉	0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.65	291.51
x ₂	x ₄	x ₆	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.8	318.48
x ₂	x ₄	x ₆	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.11	373.17
x ₂	x ₄	x ₆	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.33	235.18
x ₂	x ₄	x ₇	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.67	294.54
x ₂	x ₅	x ₆	x ₇	x ₈	x ₉	0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.4	247.73
x ₂	x ₅	x ₆	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.54	271.89
x ₂	x ₅	x ₆	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.76	312.09
x ₂	x ₅	x ₆	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.02	180.98
x ₂	x ₅	x ₇	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.4	246.94
x ₂	x ₆	x ₇	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.89	334.65
x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.5	265.82
x ₃	x ₄	x ₅	x ₆	x ₇	x ₉	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.75	309.75
x ₃	x ₄	x ₅	x ₆	x ₇	x ₁₀	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.9	336.1
x ₃	x ₄	x ₅	x ₆	x ₈	x ₉	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	0.97	171.5
x ₃	x ₄	x ₅	x ₆	x ₈	x ₁₀	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.13	200.41
x ₃	x ₄	x ₅	x ₆	x ₉	x ₁₀	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.47	259.44
x ₃	x ₄	x ₅	x ₇	x ₈	x ₉	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.34	237.28
x ₃	x ₄	x ₅	x ₇	x ₈	x ₁₀	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.49	264.07
x ₃	x ₄	x ₅	x ₇	x ₉	x ₁₀	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.75	309.71
x ₃	x ₄	x ₅	x ₈	x ₉	x ₁₀	0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.02	180.54
x ₃	x ₄	x ₆	x ₇	x ₈	x ₉	0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.87	331.14

1							2						3	4	
X ₃	X ₄	X ₆	X ₇	X ₈	X ₁₀		0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.02	357.68	
X ₃	X ₄	X ₆	X ₇	X ₉	X ₁₀		0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.36	417.91	
X ₃	X ₄	X ₆	X ₈	X ₉	X ₁₀		0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.57	276.91	
X ₃	X ₄	X ₇	X ₈	X ₉	X ₁₀		0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.88	333.07	
X ₃	X ₅	X ₆	X ₇	X ₈	X ₉		0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.59	280.56	
X ₃	X ₅	X ₆	X ₇	X ₈	X ₁₀		0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.73	305.13	
X ₃	X ₅	X ₆	X ₇	X ₉	X ₁₀		0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2	354.19	
X ₃	X ₅	X ₆	X ₈	X ₉	X ₁₀		0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.22	216.39	
X ₃	X ₅	X ₇	X ₈	X ₉	X ₁₀		0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.58	278.95	
X ₃	X ₆	X ₇	X ₈	X ₉	X ₁₀		0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.12	374.53	
X ₄	X ₅	X ₆	X ₇	X ₈	X ₉		0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.52	269.26	
X ₄	X ₅	X ₆	X ₇	X ₈	X ₁₀		0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.66	293.94	
X ₄	X ₅	X ₆	X ₇	X ₉	X ₁₀		0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.92	340.01	
X ₄	X ₅	X ₆	X ₈	X ₉	X ₁₀		0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.16	204.39	
X ₄	X ₅	X ₇	X ₈	X ₉	X ₁₀		0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.51	267.77	
X ₄	X ₆	X ₇	X ₈	X ₉	X ₁₀		0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.05	361.89	
X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀		0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.75	308.86	
X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	1.91	337.03
X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	1.14	202.47
X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	1.48	262.17
X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.2451x ₁₀	1.72	303.62
X ₁	X ₂	X ₃	X ₄	X ₅	X ₇	X ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	1.5	265.19
X ₁	X ₂	X ₃	X ₄	X ₅	X ₇	X ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	1.76	311.63
X ₁	X ₂	X ₃	X ₄	X ₅	X ₇	X ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.2451x ₁₀	1.99	351.06
X ₁	X ₂	X ₃	X ₄	X ₅	X ₈	X ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	1.04	184.36
X ₁	X ₂	X ₃	X ₄	X ₅	X ₈	X ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.2451x ₁₀	1.31	232.04
X ₁	X ₂	X ₃	X ₄	X ₅	X ₉	X ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.0027x ₉	+0.2451x ₁₀	1.62	287.2
X ₁	X ₂	X ₃	X ₄	X ₆	X ₇	X ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	2.03	358.2
X ₁	X ₂	X ₃	X ₄	X ₆	X ₇	X ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	2.37	419.07
X ₁	X ₂	X ₃	X ₄	X ₆	X ₇	X ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2.57	454.54
X ₁	X ₂	X ₃	X ₄	X ₆	X ₈	X ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	1.58	279.1

1							2							3	4
x ₁	x ₂	x ₃	x ₄	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.81	320.35
x ₁	x ₂	x ₃	x ₄	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	2.2	389.58
x ₁	x ₂	x ₃	x ₄	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.89	334.47
x ₁	x ₂	x ₃	x ₄	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.11	373.18
x ₁	x ₂	x ₃	x ₄	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.45	432.97
x ₁	x ₂	x ₃	x ₄	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.72	304.88
x ₁	x ₂	x ₃	x ₅	x ₆	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.73	305.48
x ₁	x ₂	x ₃	x ₅	x ₆	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	2.01	355.34
x ₁	x ₂	x ₃	x ₅	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2.21	391.61
x ₁	x ₂	x ₃	x ₅	x ₆	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	1.24	218.73
x ₁	x ₂	x ₃	x ₅	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.48	262.05
x ₁	x ₂	x ₃	x ₅	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.82	321.64
x ₁	x ₂	x ₃	x ₅	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.59	280.25
x ₁	x ₂	x ₃	x ₅	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.81	319.56
x ₁	x ₂	x ₃	x ₅	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.08	368.7
x ₁	x ₂	x ₃	x ₅	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.39	246.39
x ₁	x ₂	x ₃	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	2.12	375.29
x ₁	x ₂	x ₃	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.33	411.35
x ₁	x ₂	x ₃	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.67	472.81
x ₁	x ₂	x ₃	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.91	337.23
x ₁	x ₂	x ₃	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.2	389.63
x ₁	x ₂	x ₄	x ₅	x ₆	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.66	294.01
x ₁	x ₂	x ₄	x ₅	x ₆	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.93	340.95
x ₁	x ₂	x ₄	x ₅	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2.14	377.97
x ₁	x ₂	x ₄	x ₅	x ₆	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	1.17	206.44
x ₁	x ₂	x ₄	x ₅	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.42	251.03
x ₁	x ₂	x ₄	x ₅	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.74	307.57
x ₁	x ₂	x ₄	x ₅	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.52	268.9
x ₁	x ₂	x ₄	x ₅	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.75	308.77
x ₁	x ₂	x ₄	x ₅	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.01	355
x ₁	x ₂	x ₄	x ₅	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.33	235.78

1							2							3	4
x ₁	x ₂	x ₄	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	2.05	362.42
x ₁	x ₂	x ₄	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.26	398.99
x ₁	x ₂	x ₄	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.59	458.74
x ₁	x ₂	x ₄	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.84	324.69
x ₁	x ₂	x ₄	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.13	377.4
x ₁	x ₂	x ₅	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.75	309.23
x ₁	x ₂	x ₅	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.96	345.8
x ₁	x ₂	x ₅	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.24	395.55
x ₁	x ₂	x ₅	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.5	265.98
x ₁	x ₂	x ₅	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.83	323.33
x ₁	x ₂	x ₆	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.35	415.57
x ₁	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.87	330.23
x ₁	x ₃	x ₄	x ₅	x ₆	x ₇	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	2.17	384.39
x ₁	x ₃	x ₄	x ₅	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2.37	419.73
x ₁	x ₃	x ₄	x ₅	x ₆	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	1.39	245.29
x ₁	x ₃	x ₄	x ₅	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.62	286.88
x ₁	x ₃	x ₄	x ₅	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.98	350.52
x ₁	x ₃	x ₄	x ₅	x ₇	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.72	304.33
x ₁	x ₃	x ₄	x ₅	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.94	342.69
x ₁	x ₃	x ₄	x ₅	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.24	396.28
x ₁	x ₃	x ₄	x ₅	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.52	269.53
x ₁	x ₃	x ₄	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	2.28	403.88
x ₁	x ₃	x ₄	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.48	439.07
x ₁	x ₃	x ₄	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.84	502.9
x ₁	x ₃	x ₄	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.07	365.96
x ₁	x ₃	x ₄	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.36	416.77
x ₁	x ₃	x ₅	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.96	346.5
x ₁	x ₃	x ₅	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.16	381.89
x ₁	x ₃	x ₅	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.48	437.72
x ₁	x ₃	x ₅	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.71	303.16
x ₁	x ₃	x ₅	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.03	358.41

1							2							3	4
x ₁	x ₃	x ₆	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.58	458.14
x ₁	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.89	334.13
x ₁	x ₄	x ₅	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.09	370.06
x ₁	x ₄	x ₅	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.4	423.74
x ₁	x ₄	x ₅	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.65	290.96
x ₁	x ₄	x ₅	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.96	346.63
x ₁	x ₄	x ₆	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.51	443.35
x ₁	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.18	385.85
x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.5	264.95
x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	1.75	309.7
x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	1.9	336.73
x ₂	x ₃	x ₄	x ₅	x ₆	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	0.97	172.23
x ₂	x ₃	x ₄	x ₅	x ₆	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.14	202.17
x ₂	x ₃	x ₄	x ₅	x ₆	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	1.48	261.61
x ₂	x ₃	x ₄	x ₅	x ₇	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.34	237.54
x ₂	x ₃	x ₄	x ₅	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.5	265.16
x ₂	x ₃	x ₄	x ₅	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	1.76	311.33
x ₂	x ₃	x ₄	x ₅	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.04	184.07
x ₂	x ₃	x ₄	x ₆	x ₇	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.87	330.86
x ₂	x ₃	x ₄	x ₆	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.02	358.08
x ₂	x ₃	x ₄	x ₆	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.37	418.76
x ₂	x ₃	x ₄	x ₆	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.58	278.79
x ₂	x ₃	x ₄	x ₇	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.89	334.38
x ₂	x ₃	x ₅	x ₆	x ₇	x ₈	x ₉	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.58	280.05
x ₂	x ₃	x ₅	x ₆	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.73	305.41
x ₂	x ₃	x ₅	x ₆	x ₇	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.01	355.03
x ₂	x ₃	x ₅	x ₆	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.24	218.42
x ₂	x ₃	x ₅	x ₇	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.58	280.3
x ₂	x ₃	x ₆	x ₇	x ₈	x ₉	x ₁₀	0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.12	375.16
x ₂	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.52	268.43
x ₂	x ₄	x ₅	x ₆	x ₇	x ₈	x ₁₀	0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.66	293.96

1								2								3	4
x ₂	x ₄	x ₅	x ₆	x ₇	x ₉	x ₁₀		0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		1.93	340.65
x ₂	x ₄	x ₅	x ₆	x ₈	x ₉	x ₁₀		0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.17	206.15
x ₂	x ₄	x ₅	x ₇	x ₈	x ₉	x ₁₀		0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.52	268.87
x ₂	x ₄	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.05	362.31
x ₂	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.75	309.17
x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉		0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉		1.72	304.73
x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₁₀		0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		1.87	330.18
x ₃	x ₄	x ₅	x ₆	x ₇	x ₉	x ₁₀		0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		2.17	384.13
x ₃	x ₄	x ₅	x ₆	x ₈	x ₉	x ₁₀		0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.39	245.04
x ₃	x ₄	x ₅	x ₇	x ₈	x ₉	x ₁₀		0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.72	304.3
x ₃	x ₄	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.28	403.78
x ₃	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.96	346.43
x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.89	334.09
x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	1.87	330.49
x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	2.18	385.18
x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.2451x ₁₀	2.38	420.99
x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	1.4	247.09
x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.2451x ₁₀	1.64	289.21
x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+0.0027x ₉	+0.2451x ₁₀	2	353.03
x ₁	x ₂	x ₃	x ₄	x ₅	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.73	305.57
x ₁	x ₂	x ₃	x ₄	x ₅	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	1.95	344.45
x ₁	x ₂	x ₃	x ₄	x ₅	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.25	398.34
x ₁	x ₂	x ₃	x ₄	x ₅	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	1.54	273.07
x ₁	x ₂	x ₃	x ₄	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	2.29	404.46
x ₁	x ₂	x ₃	x ₄	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.49	440.13
x ₁	x ₂	x ₃	x ₄	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.85	504.25
x ₁	x ₂	x ₃	x ₄	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.08	368.19
x ₁	x ₂	x ₃	x ₄	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.37	418.58
x ₁	x ₂	x ₃	x ₅	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	1.96	347.01
x ₁	x ₂	x ₃	x ₅	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀	2.17	382.95
x ₁	x ₂	x ₃	x ₅	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀	2.48	439.13

1									2									3	4	
x ₁	x ₂	x ₃	x ₅	x ₆	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.73	305.66	
x ₁	x ₂	x ₃	x ₅	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.04	360.35	
x ₁	x ₂	x ₃	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.59	457.36	
x ₁	x ₂	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉		0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉		1.89	334.42	
x ₁	x ₂	x ₄	x ₅	x ₆	x ₇	x ₈	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		2.1	370.93	
x ₁	x ₂	x ₄	x ₅	x ₆	x ₇	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		2.4	425.01	
x ₁	x ₂	x ₄	x ₅	x ₆	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.66	293.29	
x ₁	x ₂	x ₄	x ₅	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.97	348.4	
x ₁	x ₂	x ₄	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.51	444.42	
x ₁	x ₂	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.19	386.92	
x ₁	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉		0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉		2.11	373.81	
x ₁	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₁₀		0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		2.31	409	
x ₁	x ₃	x ₄	x ₅	x ₆	x ₇	x ₉	x ₁₀		0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		2.65	468.22	
x ₁	x ₃	x ₄	x ₅	x ₆	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.88	332.65	
x ₁	x ₃	x ₄	x ₅	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.18	385.71	
x ₁	x ₃	x ₄	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.75	486.17	
x ₁	x ₃	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.41	425.7	
x ₁	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.34	413.07	
x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉		0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉		1.72	304.21	
x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₁₀		0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		1.87	330.4	
x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₉	x ₁₀		0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		2.18	384.87	
x ₂	x ₃	x ₄	x ₅	x ₆	x ₈	x ₉	x ₁₀		0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.4	246.78	
x ₂	x ₃	x ₄	x ₅	x ₇	x ₈	x ₉	x ₁₀		0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.73	305.49	
x ₂	x ₃	x ₄	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.29	404.32	
x ₂	x ₃	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.96	346.9	
x ₂	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.89	334.32	
x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.11	373.72	
x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉		2.12	374.24
x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.2451x ₁₀		2.32	409.95
x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+0.0027x ₉	+0.2451x ₁₀		2.65	469.51
x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		1.89	334.88

1										2										3	4
x ₁	x ₂	x ₃	x ₄	x ₅	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.19	387.47
x ₁	x ₂	x ₃	x ₄	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.76	487.27
x ₁	x ₂	x ₃	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.41	426.82
x ₁	x ₂	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0088x ₂	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.34	414.03
x ₁	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0004x ₁	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.57	454.31
x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀		0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀		2.12	374.11
x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇	x ₈	x ₉	x ₁₀	0.0004x ₁	+0.0088x ₂	+0.0106x ₃	+0.0190x ₄	+0.1507x ₅	+0.5952x ₆	+3.4615x ₇	+2.4851x ₈	+0.0027x ₉	+0.2451x ₁₀	2.57	455.33

x₁ = Fibre yield / plot x₂ = Days to 50% flowering x₃ = Plant height

x₄ = Number of internodes x₅ = Internodal length x₆ = Basic stem diameter

x₇ = Bark thickness x₈ = Fibre-wood ratio x₉ = Fibre length

x₁₀ = Fibre yield / plant

