

**EVALUATION OF IVY GOURD GENOTYPES (*Coccinia grandis* L.)  
FOR GROWTH, YIELD AND QUALITY UNDER  
COIMBATORE CONDITION**

Thesis submitted in part fulfilment of the requirements for the degree of  
**MASTER OF SCIENCE (HORTICULTURE) IN VEGETABLE SCIENCE**  
to the Tamil Nadu Agricultural University, Coimbatore - 641003.

By  
**G.PRIYATHARSHINI B.Sc., (Agri.)**  
**I.D.NO: 07-629-005**

**DEPARTMENT OF VEGETABLE CROPS  
HORTICULTURAL COLLEGE AND RESEARCH INSTITUTE  
TAMIL NADU AGRICULTURAL UNIVERSITY  
COIMBATORE - 641003**

**2009**

**EVALUATION OF IVY GOURD GENOTYPES (*Coccinia grandis* L.)  
FOR GROWTH, YIELD AND QUALITY UNDER  
COIMBATORE CONDITION**

**By**

**G.PRIYATHARSHINI B.Sc., (Agri.)**

**I.D.NO: 07-629-005**

**DEPARTMENT OF VEGETABLE CROPS  
HORTICULTURAL COLLEGE AND RESEARCH INSTITUTE  
TAMIL NADU AGRICULTURAL UNIVERSITY  
COIMBATORE - 641003**

**2009**



## *ACKNOWLEDGEMENT*

*Great achievements are earned with god's grace. My salutation at the feet of the omnipotent power for their blessings and kindly imbued me overcome each and every obstacles faced and finally to triumph in my present endeavor.*

*I deem it great pleasure to place on record my deep sence of gratitude and profound thanks to **Dr.M.Kannan**, Professor Department of Vegetable Crops and chairman of my Advisory Committee for meticulous guidance, suggestion, valuable counseling and constant encouragement throughout the course of this investigation. It was indeed a pleasure studying under his guidance.*

*I feel elated to keep on record the heartfelt thanks to member of the Advisory Committee, **Dr.L.Pugalendhi**, Professor and Head, Department of Vegetable Crops for his prodigal interest, valuable guidance, myriad help and prudent suggestions in embellishing this study.*

*I place my deep sense of reverence to **Dr.K.N.Ganesan**, Associate Professor, Department of Plant Breeding and Genetics, for serving on the advisory committee and for his never say die attitude in sharing his haul of wisdom in shaping the research work,*

*I wish to extend my thanks to **Dr.R.M.Vijayakumar**, Professor, PG Coordinator, Department of Fruit crops for his valuable advice during the course of investigation.*

*I extend my thanks to **Dr.P Jansirani** ,Professor ,**Dr. V. Rajasree**, Assistant professor and **Dr. T. Saraswathi**, Associate Professor for their valuable help and encouragement during the period of this study.*

*I have great pleasure and exultation in acknowledging the gratitude towards Dr. V. A. Sathyamoorthy orchard manager for his valuable help rendered in the orchard.*

*I feel proud to place on record my indebtedness to my senior friends Anbukarasi, Suganthi, Suganya and Arumugam for their constant guidance care and help during my period of study.*

*Wordy thanks can never repay the unfathomable love, affectionate encouragement, profound care and inspiration throughout the course of study by close friends, Malar, Raji, Anu, Sonu, Hema, Chandra, Indu and Shiva.*

*My heartfelt thanks for unstinted co-operation and unsolicited assistance rendered by my dear classmates, Kumaravelu, Selva, Thangarasu, Priya, Megala, Nandhu, Jeny, Muthu Kumar and Shivanand.*

*It is beyond words to express my gratitude for the love, attention, patience and encouragement of my dad, Sri. K.Gnanasekaran mum Smt.G.Malarvizhi Brother G.Mohanraj my lovable Sister G.Shanmuga priya and my kuttu masters Kiran, Divya and Aravind for the successful completion of this study.*

*I owe thanks to Vignesh Computers, TNAU, Coimbatore for neat execution of thesis with patience and precision.*

*(G. Priyatharshini)*

## **ABSTRACT**

### **EVALUATION OF CERTAIN IVY GOURD GENOTYPES (*Coccinia grandis* L.) FOR GROWTH, YIELD AND QUALITY UNDER COIMBATORE CONDITION**

**By**

**G. PRIYATHARSHINI**

**Degree : Master of Science (Horticulture) in Vegetable Science**

**Chairperson : Dr. M. KANNAN,**  
Professor (Horticulture),  
Department of Vegetable Crops,  
Horticultural College and Research Institute,  
Tamil Nadu Agricultural University,  
Coimbatore – 641 003.

**2009**

Seven diverse genotypes of ivy gourd were evaluated for growth, yield and quality under Coimbatore condition. The research was aimed at studying the variability, heritability, genetic advance and correlation with yield. The contributing characters towards yield and association of component characters with yield were also estimated. The trail was carried out at the Department of Vegetable Crops, Horticultural College and Research Institute, Coimbatore during the year 2008-2009.

The results of the present study indicated significant differences among the genotypes for all the fifteen characters highlighting wide range of variability existing among them. The analysis of variance indicated that highly significant differences recorded for the traits such as inter nodal length, fruit weight, fruit length, fruit girth, fruit number per vine, number of seeds per fruit, total soluble solids, total carbohydrate content, protein content, crude fibre and yield per vine.

The genotype CG-4 exhibited superior expression for most of the economic traits such as vine length, early production of first female flower, earlier maturity of fruits, higher fruit weight, higher fruit length and more protein content. Next to CG-4,

the genotype CG-3 expressed its superiority by registering early node production for first female flower appear, lesser inter nodal length, highest Fruit number per vine and high total soluble solids. The genotype CG-1 produced early female flowers. Further the fruits of CG-1 recorded more fruit girth and crude fibre content. The yield per vine was also high. The fruit weight and total carbohydrate content were the highest in the CG-5. The fruits of CG-7 had very less number of seeds per fruit.

In the variability studies, the traits viz., crude fibre, yield per vine, fruit weight, total soluble solids, total carbohydrate content and vine length showed higher estimates of PCV and GCV. These traits offer much scope for improvement by selection.

The heritability estimates were high for crude fibre, yield per vine, fruit length, fruit girth, fruit weight, fruit number per vine and total soluble solids. Genetic advance as per cent of mean was high for crude fibre, yield per vine, fruit weight, fruit length, total soluble solids, total carbohydrate content, number of seeds per fruit, fruit number per vine and fruit girth.

High heritability coupled with high genetic advance as per cent of mean recorded for the traits such as crude fibre, yield per vine, fruit length, fruit weight, fruit number per vine and fruit girth.

The characters such as vine length, days to first harvest, fruit girth and number of seeds per fruit exhibited positive and highly significant association, whereas fruit weight showed positive and significant correlation with yield at genotypic level. While days to first female flower appearance showed highly significant but negative correlation.

Among the yield components, close inter relationship and significant association observed between vine length and fruit girth, number of seeds per fruit. Similarly, fruit weight with fruit length and number of seeds per fruit, fruit length with total carbohydrate, fruit girth with number of seeds per fruit also showed close inter relationship.

From the findings of the present study, a selection index on fruit weight, fruit length, fruit number per vine and days to first harvest could be suggested for selection of a genotype with more yield potential in ivy gourd. Therefore the evaluation of genotypes based on the mean performance showed that the genotypes viz., CG-4, CG-1 and CG-3 ranked top for most of the economic traits.

Hence, selection can be exercised on these three genotypes in the breeding programme which would bring about identification and release of a new variety in future.

## CONTENTS

<b>Chapter No.</b>	<b>Title</b>	<b>Page No.</b>
<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
<b>2</b>	<b>REVIEW OF LITERATURE</b>	<b>3</b>
<b>3</b>	<b>MATERIALS AND METHODS</b>	<b>31</b>
<b>4</b>	<b>EXPERIMENTAL RESULTS</b>	<b>40</b>
<b>5</b>	<b>DISCUSSION</b>	<b>71</b>
<b>6</b>	<b>SUMMARY</b>	<b>80</b>
	<b>REFERENCES</b>	
	<b>PLATES</b>	

## LIST OF TABLES

<b>Table No.</b>	<b>Title</b>	<b>Page No.</b>
1	Analysis of variance for fifteen traits in ivy gourd	41
2	Mean, range, coefficient of variation (CV) and standard error (SE) for vine length (m)	42
3	Mean, range, coefficient of variation (CV) and standard error (SE) for days to first female flower appearance	42
4	Mean, range, coefficient of variation (CV) and standard error (SE) for node number at which first female flower appear	45
5	Mean, range, coefficient of variation (CV) and standard error (SE) for inter nodal length (cm)	45
6	Mean, range, coefficient of variation (CV) and standard error (SE) for days to first harvest	48
7	Mean, range, coefficient of variation (CV) and standard error (SE) for fruit weight (g)	48
8	Mean, range, coefficient of variation (CV) and standard error (SE) for fruit length (cm)	51
9	Mean, range, coefficient of variation (CV) and standard error (SE) for fruit girth(cm)	51
10	Mean, range, coefficient of variation (CV) and standard error (SE) for fruit number per vine	52
11	Mean, range, coefficient of variation (CV) and standard error (SE) for number of seeds per fruit	52
12	Mean, range, coefficient of variation (CV) and standard error (SE) for TSS ( $^{\circ}$ Brix)	55
13	Mean, range, coefficient of variation (CV) and standard error (SE) for total carbohydrate content (g/100g)	55
14	Mean, range, coefficient of variation (CV) and standard error (SE) for protein content (g/100g)	56
15	Mean, range, coefficient of variation (CV) and standard error (SE) for crude fibre (%)	56

<b>Table No.</b>	<b>Title</b>	<b>Page No.</b>
16	Mean, range, coefficient of variation (CV) and standard error (SE) for yield per vine (kg)	57
16a	Mean value of fruit number and seed number per kg of fruit	57
17	Mean, range, coefficient of variation (CV) and standard error (SE) for fifteen traits in ivy gourd	58
18	Phenotypic variance (PV), genotypic variance (GV) and environmental variance (EV) for fifteen traits in ivy gourd	61
19	Phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV) and environmental coefficient of variation (ECV) for fifteen traits in ivy gourd	62
20	Heritability (broad sense), genetic advance and genetic advance as percent of mean for fifteen traits in ivy gourd	65
21	Genotypic correlation coefficients for yield and yield components in ivy gourd	68

## LIST OF FIGURES

<b>Figure No.</b>	<b>Title</b>	<b>Page No.</b>
1	Mean performance of seven ivy gourd genotypes for vine length (m)	43
2	Mean performance of seven ivy gourd genotypes for days to first female flower appearance	43
3	Mean performance of seven ivy gourd genotypes for node number at which first female flower appear	46
4	Mean performance of seven ivy gourd genotypes for inter nodal length (cm)	46
5	Mean performance of seven ivy gourd genotypes for days to first harvest	49
6	Mean performance of seven ivy gourd genotypes for fruit length (cm)	49
7	Mean performance of seven ivy gourd genotypes for fruit number per vine	53
8	Mean performance of seven ivy gourd genotypes for TSS ( <sup>o</sup> Brix)	53
9	Mean performance of seven ivy gourd genotypes for protein content (g)	59
10	Mean performance of seven ivy gourd genotypes for yield per vine (kg)	59
11	Phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) for fifteen traits in ivy gourd	63
12	Heritability and genetic advance as per cent of mean for fifteen traits in ivy gourd	66

## LIST OF ANNEXURE

<b>Annexure No.</b>	<b>Title</b>
1	Weather data during the cropping period

## LIST OF PLATES

<b>Plate No.</b>	<b>Title</b>
1a	Nursery view of Ivy gourd
1b	Field view of the experimental plot
2	Ivy gourd genotypes CG-1 to CG-7 used in the study
3a	Field view of Ivy gourd genotypes before pruning
3b	Field view of Ivy gourd genotypes after pruning
4a	Phenotypic variability in leaves of Ivy gourd
4b	Phenotypic variability in flowers of Ivy gourd
4c	Phenotypic variability in fruits of Ivy gourd
5a	Promising genotypes with less inter nodal length
5b	Promising genotype with early maturity
6a	Promising genotypes having increased fruit length
6b	Promising genotypes with less seed content in fruits
6c	Promising genotypes having increased fruit weight
7a	Promising genotype for high Yield
7b	Promising genotype for high TSS
7c	Promising genotype for high protein content

## LIST OF ABBREVIATIONS

<b>Abbreviations</b>	<b>Expansion</b>
AC and RI	: Agricultural College and Research Institute
CV	: Coefficient of Variation
cm	: centimeter
df	: Degrees of freedom
<i>et al</i>	: co-workers
EV	: Environmental variance
ECV	: Environmental coefficient of variation
Fig	: Figure
g	: grams
GV	: Genotypic variance
GCV	: Genotypic coefficient of variation
GA	: Genetic advance
HC & RI	: Horticultural College and Research Institute
kg	: kilograms
MS	: Mean Squares
PCV	: Phenotypic coefficient of variation
PV	: Phenotypic variance
%	: Percentage
SE	: Standard error

# CHAPTER I

## INTRODUCTION

Vegetables form the most important component of a balanced diet and thus play a major role in the economic development. India can boast of its self sufficiency in food production. This self sufficiency can be achieved only when each individual in the country is assured of balanced diet.

India continues to be the second largest producer of vegetables in the world next only to China with an estimated production of about 101.43 million tonnes from an area of 6.76 million hectares at an average yield of 15 tonnes per hectare (Mathura Rai and Pandey 2007). Varied agro-climatic conditions in India make it possible to grow the largest number of the vegetable crops compared to other countries in the world. There are 61 annuals and four perennial vegetable crops which are commercially cultivated. The family Cucurbitaceae is a medium sized, phylogenically specialized and well defined one (Nayar and More, 1998)

Ivy gourd (*Coccinia grandis*.L) is a cucurbitaceous vegetable crop believed to have its origin in India. It is classified under underutilized species of family cucurbitaceae.

Ivy gourd is mainly consumed as fried vegetable in Eastern & Southern parts of the country. It can also be used for various preparations of mixed vegetable and salad. All the plant parts are useful for preparing certain preparation against diseases like bronchial catarrh, bronchitis and diabetes (Singh,1990). Ivy gourd shoot is a good source of calcium, iron, fibre and has good texture (Anon.,2002)

Ivy gourd is indigeous to india , particularly the Eastern India where a rich gene pool is available in wild as well as in homestead gardens.It is a hardy vegetable and has a vast scope of growing in marginal lands where it gives fruits almost round the year. Presently in tribal areas of Orissa, Jharkhand, Chattisgarh and Andhra Pradesh ,the fruits of ivy gourd are being gathered from natural forests or being grown in homestead gardens and small pockets.

However, ivy gourd gaining popularity among the consumers and producers due to its nutritive or medicinal value and round the year production potential .Owing to non availability of standard varieties,the farmers are cultivating only landraces which has low yield potential with variable fruits. It is grown extensively in Chattisgarh, West Bengal, Bihar and Karnataka on a commercial scale and giving remunerative returns to farmers.

Farmers of eastern and western parts of UP are cultivating varieties having long fruits, dark green with scattered small longitudinal white stripes and round end.In Bihar,a large,bold,green fruited local cultivar is very popular (Nirmal De *et al.*,2003).There is no improved cultivar recommended in this crop.Only local strains are planted in different regions.Considerable efforts are made in different research institutes for systematic improvement of this crop.

One of the primary objectives of any crop improvement programme is the identification of promising genotypes by exploiting variability within the species through a proper breeding strategy. Such a study helps to locate the desirable types and for further utilization of the selected types in the improvement programme.

Therefore, an attempt was made to estimate the fascinating array of variability and scope for improvement of important characters among seven genotypes collected from diverse sources with a view to select high yielding type with appreciable fruit quality traits.

Further, the yield of crop depends upon number of component characters, consideration on yield determinants simultaneously will be helpful in improving the efficacy of selection. Keeping this in view, the present investigation was carried out with the following objectives:

- ❖ To ascertain the extent of variability existing in the assembled genotypes
- ❖ To estimate the heritability and genetic advance as per cent of mean for yield and other components
- ❖ To determine the association between yield and other components by estimating the correlation co-efficient
- ❖ To identify the superior genotypes for further improvement

## **CHAPTER II**

### **REVIEW OF LITERATURE**

The recent advancement in biometrics has been widely used in the study on different genetic parameters of yield and its components in various crops. Ivy gourd is an under utilized vegetable crop, having wide range of variability. However, attempts for the improvement to exploit its potential are comparatively less. The present study aims at understanding the variability existing among the genotypes collected from various sources. As the available literature on ivy gourd is very meagre, other relevant cucurbitaceous crops were also reviewed in this chapter under the following headings.

#### 2.1. Variability

#### 2.2. Heritability and Genetic advance

#### 2.3. Correlation analysis

### **2.1. VARIABILITY**

A critical estimate of variability existing in the base population is a prerequisite for successful crop improvement through various plant breeding methods. Frankel (1947) emphasized the importance of variability in plant populations in designing the most important breeding programme. The partitioning of total variance into genetic and non-genetic causes becomes necessary for any breeding programme (Allard, 1960). Progress in the improvement of a population mainly depends upon the genetic variability present in it. The largest is the variability existing among population and the highest will be the chance for selection of favourable genotype (Singh and Singh, 1982). The presence of variability for yield and its contributing traits in ivy gourd and related cucurbitaceous vegetables are reviewed as below.

#### **2.1.1. Vine length (m)**

In cucurbits, vine length is an important yield contributing character. Patil and Patil (1985) noticed greater variation for various traits among 21 cucumber genotypes. In cucumber Mariappan (1989) observed moderate PCV of 18.39 per cent and low GCV of 10.77 per cent for vine length. High values of PCV and GCV (37.87 and

38.10 % respectively) for vine length in cucumber was noted by Abusaleha and Dutta (1990). A similar trend of high PCV and GCV (65.11 and 55.44 % respectively) were observed by Muthulakshmi and Pappiah *et al.* (1996) for vine length in cucumber. The low PCV and GCV for vine length was observed by Punitha (2000) in cucumber.

The vine length varied from 0.85 m to 2.40 m. Moderate values of PCV and GCV (19.52 and 19.85 % respectively) for vine length was noted by Varghese and Rajan (1993) in snake gourd. In bottle gourd, Mahendra Prasad *et al.* (1993) observed high values of PCV (34.29 %) and GCV (34.03 %) for length of vine at fruit maturity.

Similar results of moderate PCV and GCV for vine length was observed by Rajput *et al.* (1996) in bitter gourd. In bitter gourd, Puddan (2000) noticed moderate value of PCV (12.56 %) and low value of GCV (9.56%) for vine length .

A moderate PCV and GCV (19.92 and 16.43 per cent) were obtained by Lalta Prasad *et al.* (1988) in nineteen germplasm lines of watermelon. In watermelon, Krishna Prasad *et al.* (2002) observed high PCV of 26.86 per cent for this trait. Shanthi Priya *et al.* (2004) also registered high PCV and GCV (24.96 and 23.20 % respectively) for this trait. While Shanmugasundaram (2006) reported moderate PCV and GCV (17.62 and 17.31 % respectively) for vine length in watermelon.

In muskmelon, Vijay (1987) recorded low PCV and moderate GCV (10.29 and 20.74%) for vine length. In muskmelon, Tarsem Lal and Sanjay Singh (1997) observed moderate value of 17.75 and 16.58 per cent of PCV and GCV respectively for vine length. Where as Gurkaran Singh and Tarsem Lal (2005) observed moderate values of PCV and GCV (14.09 and 12.16 % respectively) for vine length in muskmelon.

### **2.1.2. Days to first female flower appearance**

Cucurbits are monoecious in nature and are cross pollinated. Earliness in terms of days taken to first female flower appearance is considered as prime economic trait in cucurbits. Abusaleha and Dutta (1990) reported low values of PCV and GCV for this trait in cucumber. In pointed gourd, Dora *et al.* (2002) observed low variability for earliness.

According to Sharma and Dhankar (1989) observed wide variation for days to first female flower appearance (58.40 to 88.00 days) in bottle gourd. Bairagi *et al.* (2005) observed considerable variation for days to first female flower appearance bottle gourd. Similarly, Suchitra and Haribabu (2007) observed moderate value of PCV and high value of GCV (20.20 and 14.42 % respectively) for this trait in bottle gourd .

Suribabu *et al.* (1986) low values of PCV and GCV (6.45 and 4.51 % respectively) were recorded for days to first female flower appearance in bitter gourd. However. In contrast, Sumathi (2001) registered very low PCV of 3.78 per cent and moderate GCV of 12.29 per cent for days to first female flower appearance in bitter gourd.

In watermelon, Krishna Prasad *et al.* (2002) noted low PCV (9.87 %) for earliness. Similar results obtained by Shanthi Priya *et al.* (2004). Which limits the scope for further improvement of this trait (earliness) in watermelon. Shanmugasundaram (2006) also registered moderate value of PCV and low value of GCV (13.61 and 6.80 % respectively ) for days to first female flower appearance in watermelon.

In muskmelon, Tarsem Lal and Sanjay Singh (1997) observed low values of PCV and GCV observed for days taken for first female flower appearance. Similarly, Gurkaran Singh and Tarsem Lal (2005) reported low variability for this trait in muskmelon.

### **2.1.3. Node number at which first female flower appear**

According to Abusaleha and Dutta (1990) noted high values of PCV and GCV for nodal position of female flowers (41.20 and 36.4% respectively ) in cucumber. Similarly, Bairagi *et al.* (2005), the greater variation was noticed for this trait in cucumber. In pointed gourd by Dora *et al.*(2002).

Ananthan *et al.*(2005) noticed moderate PCV and GCV (19.01 and 15.46 % respectively ) for this same trait in ridge gourd .In ridge gourd, Ratna Prabha *et al.*(2007) noticed high variability of PCV and GCV(25.99 and 24.38 % respectively) for node to first female flower appearance.

In bottle gourd, Sharma and Dhankar (1989) observed wide variation for node to first female flower appearance. Similarly, Suchitra and Haribabu (2007) noticed very high variability of PCV and GCV (63.88 and 53.97 % respectively) for this trait in bottle gourd. While Suribabu *et al.*(1986) showed moderate variability of PCV and GCV (13.64 and 10.66 % respectively) for this trait in bitter gourd. High values of variability in terms PCV and GCV for node number at first female flower appearance in bitter gourd was reported by Sheo Pujan Singh *et al.* (1996). Samadia (2007) noted high values of PCV and GCV (27.32 % and 27.23%) for this trait in bitter gourd. But in pumpkin, low PCV and GCV were obtained for this trait (Mohanty,2003).

In watermelon , Shanthi Priya *et al.* (2004) noticed moderate PCV and GCV (21.38 and 17.62 % respectively ) for the same trait. In another study of watermelon, Shanmuga sundaram (2006) observed moderate values of PCV and GCV (18.68 and 17.97 % respectively ) for this trait. Gurkaran Singh and Tarsem Lal (2005) also noticed high values of PCV and GCV (39.54 and 35.70 % respectively ) for this trait in muskmelon. While Torkadi *et al.* (2007) noticed moderate values of PCV and GCV for this trait in muskmelon.

#### **2.1.4. Days to first harvest**

In general, days taken for first female flower appearance and node at which first female appeared are considered as indicators of earliness .Likewise days to first harvest is also considered as economic trait and as an indicator of earliness.

In ribbed gourd, Sathyanarayana Reddy and Rama Rao (1984) reported low PCV and GCV for days to first harvest. Sanju Susan Mathew and Abdul Khader (1999) reported moderate PCV and GCV (20.16 and 20.11 % respectively) for this trait in snake gourd. In bottle gourd, Maurya *et al.* (2003) noted considerable variation for this trait (60.06 to 66.84 days ). Similarly, Ahmed *et al.*(2005) recorded low values of PCV and GCV (3.29 and 3.04 % respectively) for days to first picking in bottle gourd. In bitter gourd, Rajput *et al.* (1996) observed low values of PCV and GCV (6.40 and 5.50 % respectively) for days to first maturity.

It was also again confirmed by Lalta Prasad *et al.* (1988) with low values of PCV as well as GCV for days to first picking in watermelon. Shanthi Priya (2004) observed

very low GCV of 4.31 per cent and PCV of 6.18 per cent for days to first maturity in watermelon. In watermelon, Shanmugasundaram (2006) recorded low values of PCV (14.97 %) for this trait. Torkadi *et al.* (2007) reported very low values of PCV and GCV (4.33 and 2.33 % respectively) for days to first harvest.

In muskmelon, Swamy *et al.* (1985) also reported a very low PCV as well as GCV (8.03 and 5.53 per cent respectively) for days to first harvest. Similar results of low PCV and GCV (10.69 and 8.11 % respectively) for this trait was reported by Vijay (1987) in muskmelon. In muskmelon, Tarsem Lal and Sanjay Singh (1997) observed low values of PCV and GCV for days from transplanting to first fruit harvest. In muskmelon also, low values of PCV and GCV (6.20 and 5.43 % respectively) for days to first harvest was noticed by Gurkaran Singh and Tarsem Lal (2005).

#### **2.1.5. Fruit weight (g)**

A wide variation of fruit weight was observed in cucurbits germplasm. In cucumber, Mariappan (1989) and Nagaprasuna and Rama Rao (1989) observed high values of PCV and GCV for fruit weight. In ridge gourd Varalakshmi *et al.* (1995) recorded high values of PCV and GCV (43.59 and 42.29 % respectively) for fruit weight. Rakhi and Ragamony (2005) noticed high PCV and GCV for this same trait in ridge gourd.

Whereas high values of PCV and GCV (25.05 and 24.62 % respectively) was observed in snake gourd by Varghese and Rajan (1993) for this trait. In bottle gourd also Sheo Pujan Singh *et al.* (1996) recorded low values of PCV and GCV (10.81 and 8.17 % respectively) for fruit weight.

Rajput *et al.* (1996) recorded low values of PCV and GCV (15.5 and 15.2 % respectively) for fruit weight in bitter gourd. These values were also confirmed by Puddan (2000) in bitter gourd.

In watermelon, Lalta Prasad *et al.* (1988) reported high values of PCV and GCV (37.80 and 35.48 % respectively) for fruit weight. High GCV and PCV (31.72 and 39.97 % respectively) were also confirmed in watermelon by Shanthi Priya (2004).

Swamy *et al.* (1985) reported that the PCV as well as GCV were high for fruit weight in muskmelon.

#### **2.1.6. Fruit length (cm)**

Fruit length is considered as an important trait to be measured in cucurbits which gives an idea on method of packing especially during transport to long distance market.

In cucumber, similar results of moderate values of PCV and GCV were reported by Abusaleha and Dutta (1990). Punitha (2000) observed also, low values of PCV and very low GCV for fruit length in cucumber. In ridge gourd, moderate values of PCV and GCV (20.65 and 15.64 % respectively) for fruit length was reported by Krishna Prasad and Singh(1989). However, Varghese and Rajan (1993) reported high values of PCV and GCV (32.56 and 32.15% respectively) for this trait in snake gourd. In bottle gourd, low variability of fruit length as low values of PCV and GCV was recorded by Sheo Pujan Singh *et al.* (1996).

In bitter gourd, Rajput *et al.* (1996) reported high values of PCV and moderate value of GCV for fruit length. In bitter gourd, Puddan (2000) observed moderate values of PCV and GCV (21.58 and 20.58% respectively) for this trait. Sumathi (2001) reported low values of PCV and GCV for fruit length in bitter gourd.

In contrast, Devi Singh *et al.* (2006) recorded high values of PCV and GCV (49.23 and 36.08 % respectively) for fruit length in bitter gourd. Lalta Prasad *et al.* (1988) observed a similar trend of moderate values of PCV and GCV (14.52 and 12.59 % respectively) for fruit length in watermelon. However Torkadi *et al.* (2007) noted high values of PCV and GCV (35.75 and 34.32 % respectively) for fruit length in muskmelon.

#### **2.1.7. Fruit girth (cm)**

During transport of cucurbits to long distance market, fruits with moderate fruit girth are considered favourably as more number of fruits can be packed in a compact manner in unit area. This would facilitate to accommodate more number of fruits in unit area.

In cucumber, Mariappan (1989) noticed high value of PCV (89.95 %) and moderate value of GCV (21.00 %) for fruit girth. But in contrast, low values of PCV and GCV for the same trait in cucumber was reported by Abusaleha and Dutta (1990). Muthulakshmi and Pappiah *et al.* (1996) observed high value of PCV of 41.75 per cent and moderate value of GCV of 14.37 per cent for fruit girth in cucumber. Moderate values of PCV and GCV (15.53 and 15.50 % respectively) for fruit girth was recorded by Punitha (2000) in cucumber.

In snake gourd, Varghese and Rajan (1993) recorded moderate values of PCV and GCV (21.23 and 20.26 % respectively) for fruit girth. Rajput *et al.* (1996) also observed moderate values of PCV and GCV (18.60 and 17.80 per cent) for this trait in snake gourd. But in bitter melon Puddan (2000) observed low values of PCV and GCV (6.96 and 6.73 % respectively) for this trait. A moderate variability of PCV and GCV (14.09 and 12.23 % respectively) for fruit girth in watermelon was reported by Lalta Prasad *et al.* (1988).

#### **2.1.8. Fruit number per vine**

In any crop improvement programme much emphasis is paid to improve the fruit number per vine as it is a prime economic trait that decides the yield potential of a crop, for which genetic analysis of variability is essential in selection of superior genotypes in germplasm. In cucumber, Rajput *et al.* (1991) reported high values of PCV and GCV (24.40 and 20.10 % respectively) for this trait.

In ridge gourd, Krishna Prasad and Singh (1989) gained high values of PCV and GCV (40.40 and 26.33 % respectively) for fruit number per vine. Varalakshmi *et al.* (1995) recorded high values of PCV and GCV (52.11 and 48.42 % respectively) for fruits per plant in ridge gourd. Similarly Ananthan *et al.* (2005) recorded high PCV and GCV (32.50 and 26.12 % respectively) for this trait in ridge gourd.

In bottle gourd, Mahendra Prasad *et al.* (1993) observed high value of PCV and GCV for fruit number per vine. Singh *et al.* (1996) also observed moderate values of PCV and GCV for fruit number per vine in bottle gourd. Suribabu *et al.* (1986) observed low values of PCV and GCV (4.61 and 2.61% respectively) for fruit

number per vine in bitter gourd. Sendurkumaran *et al.* (1998) reported that PCV and GCV were high for fruit number per vine in pumpkin.

Lalta Prasad *et al.* (1988) recorded high values of PCV and GCV for fruit number per vine in watermelon. Shanmugasundaram (2006) observed moderate values of PCV and GCV (20.05 and 15.53 % respectively) for fruit number per vine in watermelon.

Torkadi *et al.* (2007) noticed moderate values of PCV and GCV (18.60 and 17.80 % respectively) for fruit number per vine in muskmelon. Rukam *et al.* (2008) reported high PCV and GCV (31.07 and 27.61 % respectively) for this trait in muskmelon. In round melon, Samadia (2007) recorded high values of PCV and GCV (39.86 and 39.84 % respectively) for fruit number per vine.

#### **2.1.9. Seed number per fruit**

Availability of lesser number of seeds is a preferred character in fruits for flesh consumption. Development of varieties with seedless fruits is preferred. However, fruits with less seeds and soft seeds are yet another approach in cucurbits improvement.

In cucumber, Marriappan (1989) recorded high values of PCV (39.18 %) and GCV (38.45 per cent) for seed number per fruit. In pointed Gourd, Singh *et al.* (1992) reported low values of PCV (10.11 %) as well as GCV (9.32 %) for seed number per fruit.

Varalakshmi *et al.* (1995) recorded high values of PCV and GCV (46.05 % and 45.78 %) for number of seeds per fruit in ridge gourd. Similarly Karuppiyah *et al.* (2002) PCV and GCV were low for this trait (17.19 and 15.37 % respectively) in ridge gourd. Varghese and Rajan (1993) reported high values of PCV (27.87 %) and GCV (29.89 %) for seed number per fruit in snake gourd.

Sanju Susan Mathew and Abdul Kader (1999) obtained high PCV and GCV for this trait in snake gourd. Rajput *et al.* (1996) noted high values of PCV (33 %) and GCV (32.6 %) for seed number per fruit in bitter gourd.

In pumpkin, Sendurkumaran *et al.* (1998) recorded moderate PCV of 22.51 per cent and GCV of 20.53 per cent for this trait. Lalta Prasad *et al.* (1988) noticed high values of PCV (36.23 %) as well as GCV (34.37 %) for seed number per fruit in watermelon.

#### **2.1.10. Total soluble solids (<sup>0</sup>Brix)**

In watermelon, Gill and Kumar (1986) stated that the TSS content exhibited a low PCV (6.13 %) and GCV (5.58 %). Lalta Prasad *et al.* (1988) moderate values of PCV and GCV (19.69 and 18.29 % respectively) for TSS in watermelon.

In watermelon, Krishna Prasad *et al.* (2002) recorded low magnitude of PCV (19.35 %) for this trait.

Shanthi Priya *et al.* (2004) also recorded low values of PCV and GCV (12.94 and 6.63 % respectively) for this trait. (2006) observed low values of PCV and GCV (11.36 and 11.17 % respectively) for this trait in watermelon.

Tarsem Lal and Sanjay Singh (1997) observed high values of PCV and GCV (31.78 and 31.44 % respectively) for this trait in musk melon. Whereas low values of PCV and GCV (11.56 and 9.18 % respectively) for TSS was observed by Gurkaran Singh and Tarsem Lal (2005).

Torkadi *et al.* (2007) reported moderate values of PCV and GCV (24.70 and 22.56 % respectively) for this trait in muskmelon. Rukam *et al.* (2008) also reported moderate PCV and GCV (12.78 and 12.67 % respectively) for this trait in musk melon.

#### **2.1.11. Yield per vine (kg)**

Yield is a complex trait and depends on many traits. Based on the extent of variability of yield, the crop improvement programme is designed. The work done in various cucurbits on yield variability by previous workers is furnished below in a tabular format.

<b>Remarks</b>	<b>Crop</b>	<b>Reference</b>
High PCV (22.37 %) and moderate GCV (17.84 %)	Cucumber	Mariappan (1989)
High PCV (30.86 %) and GCV (32.32 %)	Cucumber	Muthulakshmi and Pappiah <i>et al.</i> (1996)
Moderate PCV (31.10 %) and GCV (29.95 %)	Cucumber	Punitha (2000)
Moderate PCV (16.46 %) and GCV (17.54 %)	Cucumber	Ashish kumar <i>et al.</i> (2008)
High PCV (35.5 %) and GCV (31.12 %)	Ridge gourd	Ananthan <i>et al.</i> (2005)
High PCV (54.39 %) and GCV (53.68 %)	Ridge gourd	Ratna Prabha <i>et al.</i> (2007)
High PCV (65.37 %) and GCV (64.35 %)	Bottle gourd	Suchitra and Haribabu (2007)
High PCV (33.70 %) and GCV (32.30 %)	Bitter gourd	Rajput <i>et al.</i> (1996)
High PCV (24.51%) and GCV (26.97 %)	Bitter gourd	Puddan (2000)
High GCV (26.58%) and PCV (21.71%)	Watermelon	Lalta Prasad <i>et al.</i> (1988)
High PCV (35.38 %) and GCV (27.80 %)	Watermelon	Shanthi Priya <i>et al.</i> (2004)
High PCV of 35.41 per cent	Watermelon	Krishna Prasad <i>et al.</i> (2002)
High PCV and GCV	Muskmelon	Krishna Prasad <i>et al.</i> (2004)
High PCV (59.42 %) and GCV (57.05 %)	Culinary melon	Rakhi and Rajmony (2005)
High PCV (44.29 %) and GCV (44.27 %)	Round melon	Samadia (2007)

## 2.2. Heritability and genetic advance

Heritability is the proportion of genotypic variance to the total variance i.e. phenotypic variance (Lush, 1940 and Burton, 1952) Heritability in broad sense denotes the functioning of the genotype as a whole. Information on heritability is important to the plant breeders as it gives an indication of the effectiveness with which the selection of genotypes with phenotypic expression. Genetic advance or genetic gain is a measure of the expected progress under a selected scheme. The importance of genetic advance is to assess the genetic gain of the offspring over their parents due to selection without waiting for many generations.

According to Hanson (1961) heritability and genetic advance are complementary factors. The value of heritability can also be used to compute the expected genetic gain through selection. Johnson *et al.* (1955b) and Lerner (1958) pointed out that heritability estimates along with the genetic advance were usually more useful than heritability alone in predicting the resultant effect from selecting the best genotype. The heritability and genetic advance of various cucurbits for different traits is reviewed here under.

### 2.2.1. Vine length (m)

In pumpkin, high heritability (50.92 %) with moderate genetic advance (19.80) was reported by Nisha (1999). Swamy *et al.* (1985) and Lalta Prasad *et al.* (1988) reported high heritability estimates combined with high genetic advance for vine length of watermelon. Krishna Prasad *et al.* (2002) observed high heritability associated with high genetic advance of 90.81 and 50.39 per cent respectively for this trait in watermelon. Moderate heritability with low genetic advance of 55.60 per cent and 37.60 per cent were noticed in muskmelon.

Heritability and Genetic Advance	Crop	Reference
Moderate heritability and moderate genetic advance	Cucumber	Mariappan (1989)
High heritability and high genetic advance	Cucumber	Muthulakshmi and Pappiah <i>et al.</i> (1996)

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
High heritability (93.55 %) and high genetic advance as per cent of mean (37.89 %)	Cucumber	Punitha (2000)
High heritability (97.00 %) and high genetic advance as per cent of mean (39.55 %)	Snake gourd	Varghese (1991)
High heritability (63.40 %) and high genetic advance as per cent of mean (38.60 %)	Bitter gourd	Rajput <i>et al.</i> (1996)
High heritability (86.40 %) and high genetic advance as per cent of mean (44.41 %)	Watermelon	Shanthi Priya <i>et al.</i> (2004)
High heritability (94.63 %) and high genetic advance as per cent of mean (27.53 %)	Watermelon	Shanmugasundaram (2006)
High heritability (87.00 %) and high genetic advance as per cent of mean (31.89 %)	Muskmelon	Tarsem Lal and Sanjay Singh (1997)
Moderate heritability (74.48 %) and low genetic advance as per cent of mean (21.61%)	Muskmelon	Gurkaran Singh and Tarsem Lal (2005)

### **2.2.2. Days to first female flower appearance**

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
High heritability (89.30 %) and low genetic advance as per cent of mean (5.90 %)	Cucumber	Mariappan (1989)
High heritability (99.08 %) and high genetic advance (40.98 %)	Cucumber	Abusaleha and Dutta (1990)
High heritability and moderate genetic advance	Cucumber	Saikia <i>et al.</i> (1995)

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
High heritability (81.61 %) and low genetic advance (11.56 %)	Cucumber	Muthulakshmi and Pappiah <i>et al.</i> (1996)
High heritability (88.62 %) and high genetic advance (26.43 %)	Cucumber	Punitha (2000)
High heritability (91.20 %) and moderate genetic advance (15.70 %) as per cent of mean	Cucumber	Ashish kumar <i>et al.</i> (2008)
High heritability (99.46 %) and high genetic advance (21.98 %)	Bitter gourd	Puddan (2000)
High heritability (84.03 %) and high genetic advance as per cent of mean (17.28 %)	Pumpkin	Nisha (1999)
High heritability (93.86 %) and moderate genetic advance (26.31 %) as percent of mean	Watermelon	Shanmugasundaram (2006)
High heritability (97.00 %) and high genetic advance as per cent of mean (41.72 %)	Muskmelon	Tarsem Lal and Sanjay Singh (1997)
Moderate heritability (56.39 %) and low genetic advance (10.89 %) as per cent of mean	Musk melon	Krishna Prasad <i>et al.</i> (2004)
High heritability (70.92 %) and moderate genetic advance (23.81 %) as per cent of mean	Muskmelon	Gurkaran Singh and Tarsem Lal (2005)

### 2.2.3. Node number at which first female flower appear

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
High heritability and High genetic advance as per cent of mean	Cucumber	Saikia <i>et al.</i> (1995)
High heritability (92.33 %) and moderate genetic advance as per cent of mean.	Pointed gourd	Dora <i>et al.</i> (2002)
High heritability and high genetic advance as per cent of mean	Ridge gourd	Ratna Prabha <i>et al.</i> (2007)
High heritability (82 %) High genetic advance (77.97 %)	Bottle gourd	Suchitra and Haribabu (2007)
High heritability (88.18 %) and high genetic advance as per cent of mean (31.45 %)	Bitter gourd	Devi Singh <i>et al.</i> (2006)
High heritability and high genetic advance as per cent of mean	Watermelon	Shanthi Priya <i>et al.</i> (2004)
High heritability (92.59 %) and high genetic advance as percent of mean (35.62 %)	Watermelon	Shanmugasundaram (2006)
High heritability (81.54 %) and high genetic advance as per cent of mean (66.41 %)	Muskmelon	Gurkaran Singh and Tarsem Lal (2005)
High heritability (78.20 %) and high genetic advance as per cent of mean (40.30 %)	Muskmelon	Torkadi <i>et al.</i> (2007)

### 2.2.4. Inter nodal length (cm)

In many cucurbits, high values of heritability and genetic advance for inter nodal length were observed which offers much scope for improvement.

<b>Heritability and Genetic Advance</b>	<b>crop</b>	<b>Reference</b>
Moderate heritability and high genetic advance as per cent of mean	Ribbed gourd	Satyanarayana Reddy <i>et al.</i> (1984)
High heritability and low genetic advance as per cent of mean	Bitter gourd	Muralee Yadav <i>et al.</i> (2004)

### 2.2.5. Days to first harvest

Heritability and Genetic Advance	Crop	Reference
High heritability (94.40 %) and moderate genetic advance (15.40 %)	Cucumber	Saikia <i>et al.</i> (1995)
High heritability (74.50 %) and low genetic advance as per cent of mean (6.70 %)	Bitter gourd	Rajput <i>et al.</i> (1996)
Low heritability and low genetic advance as per cent of mean	Watermelon	Lalta Prasad <i>et al.</i> (1988)
Moderate heritability (48.50 %) and low genetic advance as per cent of mean (6.18 %)	Watermelon	Shanthi Priya <i>et al.</i> (2004)
High heritability (95.13 %) and moderate genetic advance as per cent of mean (18.87 %)	Watermelon	Shanmugasundaram (2006)
High heritability (98.00 %) and moderate genetic advance as per cent of mean (21.00 %)	Muskmelon	Tarsem Lal and Sanjay Singh (1997)
Moderate heritability (29.50 %) and low genetic advance as per cent of mean (2.63 %)	Muskmelon	Torkadi <i>et al.</i> (2007)

### 2.2.6. Fruit weight (g)

Information on heritability coupled with genetic advance for fruit weight will be highly useful in selecting this trait for screening of germplasm.

Heritability and Genetic Advance	Crop	Reference
High heritability (95.40 %) and high genetic advance (48.17 %)	Snake gourd	Varghese (1991)
High heritability and moderate genetic advance as per cent of mean (99.00 % and 33.34 %)	Bottle gourd	Ahmed <i>et al.</i> (2005)
High heritability and high genetic advance as per cent of mean	Bitter gourd	Rajput <i>et al.</i> (1996)
Low heritability (19.46 %) and high genetic advance as per cent of mean (59.79 %)	Bitter gourd	Devi Singh <i>et al.</i> (2006)

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
High heritability (96.60 %) and high genetic advance (88.93 %)	Bitter gourd	Raja <i>et al.</i> (2007)
High heritability (98.95 %) and high genetic advance as per cent of mean. (112.24 %)	Pumpkin	Dhatt and Hardevinder Singh (2008)
High heritability and high genetic advance as per cent of mean	Watermelon	Lalta Prasad <i>et al.</i> (1988)
High heritability and high genetic advance as per cent of mean	Watermelon	Rajendran (1989)
High heritability (62.90 %) High genetic advance as per cent of mean (51.86 %)	Watermelon	Shanthi Priya (2004)
High heritability (93.56 %) and moderate genetic advance as per cent of mean (38.88 %)	Watermelon	Shanmugasundaram (2006)
High heritability (93.00 %) and high genetic advance (69.24 %)	Muskmelon	Tarsem Lal and Sanjay Singh (1997)
High heritability (83.56 %) and high genetic advance as per cent of mean (63.08 %)	Muskmelon	Gurkaran Singh and Tarsem Lal (2005)
High heritability and high genetic advance as per cent of mean (97.97 % and 86.09 %)	Culinary melon	Rakhi and Rajamony (2005)
High heritability (99.80 %) and high genetic advance as per cent of mean (154.44 %)	Muskmelon	Torkadi <i>et al.</i> (2007)
High heritability (99.50 %) and high genetic advance (40.03 %)	Round Melon	Samadia (2007)

### **2.2.7. Fruit length (cm)**

Estimation of heritability and genetic advance for fruit length of ivy gourd is highly useful in screening though this parameter has reported in many cucurbits.

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
High heritability and high genetic advance as per cent of mean	Cucumber	Muthulakshmi and Pappiah <i>et al.</i> (1996)
High heritability (94.41 %) and high genetic advance as per cent of mean (28.38 %)	Cucumber	Punitha (2000)
High heritability (93.40 %) and high genetic advance (28.33 %) as percent of mean	Cucumber	Ashish kumar <i>et al.</i> (2008)
High heritability and high genetic advance as per cent of mean	Ridge gourd	Ratna Prabha <i>et al.</i> (2007)
High heritability and low genetic advance as per cent of mean	Snake gourd	Varghese (1991)
High heritability (88.24 %) and high genetic advance as per cent of mean (41.31 %)	Bottle gourd	Sheo Pujan Singh <i>et al.</i> (1996)
High heritability and high genetic advance as percent of mean (99.00 % and 61.09 %)	Bottle gourd	Ahmed <i>et al.</i> (2005)
High heritability and high genetic advance as per cent of mean	Bitter gourd	Rajput <i>et al.</i> (1996)
High heritability and moderate genetic advance as per cent of mean	Bitter gourd	Puddan (2000)
High heritability (97.37 %) and high genetic advance as per cent of mean (65.73%)	Bitter gourd	Devi Singh <i>et al.</i> (2006)
High heritability and high genetic advance as per cent of mean	Pumpkin	Nisha (1999)
High heritability (86 %) and high genetic advance as per cent of mean (68.39 %)	Muskmelon	Tarsem Lal and Sanjay Singh (1997)
High heritability and high genetic advance (99.74 % and 51.9 %)	Culinary melon	Rakhi and Rajamony (2005)
High heritability (92.10 %) and high genetic advance as per cent of mean (30.23 %)	Muskmelon	Torkadi <i>et al.</i> (2007)

### 2.2.8. Fruit girth (cm)

In many cucurbits, high values of heritability and genetic advance for fruit girth are expressed which offers much scope for improvement.

Heritability and Genetic Advance	Crop	Reference
High heritability and high genetic advance as per cent of mean	Cucumber	Mariappan (1989)
High heritability and high genetic advance as per cent of mean	Cucumber	Muthulakshmi and Pappiah <i>et al.</i> (1996)
High heritability (97.21 %) and high genetic advance as per cent of mean (58.83 %)	Cucumber	Punitha (2000)
High heritability (91.20 %) and moderate genetic advance (17.00 %) as per cent of mean	Bitter gourd	Rajput <i>et al.</i> (1996)

### 2.2.9. Fruit number per vine

Available literature on heritability and genetic advance estimation for fruit number per vine in cucurbits reviewed as below.

Heritability and Genetic Advance	Crop	Reference
High heritability and high genetic advance as per cent of mean	Cucumber	Abusaleha and Dutta (1988)
Moderate heritability and high genetic advance as per cent of mean	Cucumber	Mariappan (1989)
High heritability and High genetic advance as per cent of mean	Cucumber	Muthulakshmi and Pappiah <i>et al.</i> (1996)
Moderate heritability and high genetic advance as per cent of mean	Cucumber	Punitha (2000)
High heritability (85.40 %) and high genetic advance (27.18 %) as per cent of mean	Cucumber	Ashish kumar <i>et al.</i> (2008)
High heritability and high genetic advance as per cent of mean	Ridge Gourd	Krishna Prasad and Singh, (1989)

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
High heritability and high genetic advance as per cent of mean	Ridge gourd	Ratna Prabha <i>et al.</i> (2007)
High heritability (95.00 %) and high genetic advance (78.08 %) as per cent of mean	Snake gourd	Varghese (1991)
High heritability and high genetic advance as per cent of mean	Bottle gourd	Sheo Pujan Singh <i>et al.</i> (1996)
High heritability and high genetic advance as per cent of mean (99.00 % and 79.55 %)	Bottle gourd	Ahmed <i>et al.</i> (2005)
Moderate heritability and low genetic advance as per cent of mean	Bitter gourd	Suribabu <i>et al.</i> (1986)
High heritability and high genetic advance as per cent of mean	Bitter gourd	Chaudhari <i>et al.</i> (1991)
High heritability and high genetic advance as per cent of mean	Bitter gourd	Rajput <i>et al.</i> (1996)
High heritability (97.21 %) and high genetic advance (58.83 %) as per cent of mean	Bitter gourd	Puddan (2000)
High heritability (79.50 %) and high genetic advance (43.17 %) as per cent of mean	Pumpkin	Nisha (1999)
High heritability (97.27 %) and high genetic advance as per cent of mean. (118.56 %)	Pumpkin	Dhatt and Hardevinder Singh (2008)
Low heritability (19.80 %) and low genetic advance as per cent of mean (16.98 %)	Watermelon	Shanthi Priya <i>et al.</i> (2004)
High heritability (59.99 %) and moderate genetic advance as per cent of mean (24.78 %)	Watermelon	Shanmugasundaram (2006)
Moderate heritability and high genetic advance as per cent of mean	Muskmelon	Vijay (1987)
Low heritability	Muskmelon	Tarsem Lal and Sanjay Singh (1997)

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
Moderate heritability (58.15 %) and high genetic advance as per cent of mean (70.73 %)	Muskmelon	Krishna Prasad <i>et al.</i> , (2004)
Low heritability and moderate genetic advance as per cent of mean	Chow-chow	Singh <i>et al.</i> (2002)

#### **2.2.10. Seed number per fruit**

Availability of literature on estimation of heritability and genetic advance for seed number per fruit in cucurbits. Ahmed *et al.*(2005) also reported high heritability of 98.00 per cent and high genetic advance as per cent of mean 93.69 for this trait in bottle gourd. High heritability coupled with higher genetic advance as per cent of mean were recorded for this trait in bitter gourd as reported by (Rajput *et al.*, 1996). Sendurkumaran *et al.* (1998) reported that high heritability of 92.51 per cent and high genetic advance as per cent of mean for this trait in pumpkin .

Lalta Prasad *et al.*(1988) recorded high heritability and high genetic advance for this trait in watermelon. Similarly, Rajendran (1989) also reported high heritability and high genetic advance for seed number per fruit in watermelon.

#### **2.2.11. Total soluble solids (<sup>0</sup>Brix)**

Information on genetic analysis of qualitative trait like TSS is very negligible. However, available literature on this aspect is reviewed here.

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
High heritability and high genetic advance as per cent of mean	Ridge gourd	Ratna Prabha <i>et al.</i> (2007)
Moderate heritability and moderate genetic advance as per cent of mean	Watermelon	Vashistha <i>et al.</i> (1987)
High heritability and high genetic advance as per cent of mean	Watermelon	Lalta Prasad <i>et al.</i> (1988)
High heritability (73.70 %) and low genetic advance as per cent of mean (19.66 %)	Watermelon	Shanthi Priya <i>et al.</i> (2004)

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
High heritability (96.67 %) and low genetic advance as per cent of mean (22.62 %)	Watermelon	Shanmugasundaram (2006)
High heritability (63.12 %) and low genetic advance as per cent of mean (15.03 %)	Muskmelon	Gurkaran Singh and Tarsem Lal (2005)
High heritability (78.50 %) and high genetic advance as per cent of mean (39.96 %)	Muskmelon	Torkadi <i>et al.</i> (2007)

### 2.2.12. Yield per vine (Kg)

Estimation of heritability and genetic advance for yield, a dependable character of other quantitative traits is highly useful in any crop improvement. The highest expected heritability of 100.00 per cent was reported by Saikia *et al.* (1995) in cucumber. In bottle gourd, Mahendra Prasad *et al.* (1993) observed high heritability with high genetic advance for yield per vine. High heritability and high genetic advance was recorded for yield in watermelon by Lalta Prasad *et al.* (1988).

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
High heritability and high genetic advance as per cent of mean	Cucumber	Mariappan (1989)
High heritability (94.41 %) and high genetic advance as per cent of mean (28.38 %)	Cucumber	Punitha (2000)
High heritability and high genetic advance as per cent of mean	Ridge gourd	Ratna Prabha <i>et al.</i> (2007)
High heritability (92.00 %) and low genetic advance	Snake gourd	Varghese (1991)
High heritability (88.24 %) and high genetic advance as per cent of mean (41.31 %)	Bottle gourd	Sheo Pujan Singh <i>et al.</i> (1996)
High heritability and moderate to high genetic advance as per cent of mean	Bitter gourd	Suribabu <i>et al.</i> (1986)

<b>Heritability and Genetic Advance</b>	<b>Crop</b>	<b>Reference</b>
High heritability (49.23 %) and moderate genetic advance as per cent of mean (18.20 %)	Bitter gourd	Puddan (2000)
High heritability and high genetic advance	Pumpkin	Nisha (1999)
High heritability and high genetic advance	Watermelon	Rajendran (1989)
High heritability (61.80 %) and moderate genetic advance as per cent of mean (45.01 %)	Watermelon	Shanthi Priya <i>et al.</i> (2004)
High heritability (93.56 %) and moderate genetic advance as per cent of mean (64.87)	Watermelon	Shanmugasundaram (2006)
Moderate heritability and high genetic advance	Muskmelon	Swamy <i>et al.</i> (1985)
High heritability and high genetic advance	Summer squash	Dahiya <i>et al.</i> (1990)

## **2.3. ASSOCIATION OF CHARACTERS**

### **2.3.1. CORRELATION**

The efficiency of selection in any breeding programme mainly depends on the knowledge of association of characters. Since yield is a complex character, correlation analysis helps in the evaluation of relationship existing between yield and its components along with the inter relationships among yield components. In a breeding programme, selection of plants based on yield alone is not a dependable factor since yield as a whole is governed by number of factors. Moll and Stuber (1974) suggested that correlation among traits enhanced the rate of selection response in the primary traits. Gardener (1961) and Frey (1967) observed increased yield by indirect selection of component characters. According to Johnson *et al.* (1955b) correlation between important and less important characters may reveal that some of the later are useful as indicators of one or more of the important characters. Studies with relation to correlation of various characters to yield in cucurbits are furnished below.

### **2.3.1.1. Studies on correlation of different biometric traits for yield per vine in Cucurbitaceous crops**

In ivy gourd, Sibyvarghese *et al.*(2005) reported fruit yield per plant had highly positive genotypic and significant positive phenotypic correlation with number of fruits per plant and vine length. In ivy gourd, Sarnaik *et al.*(1999) reported that the yield per plant showed positive and significant correlation with number of fruits per plant at genotypic level and phenotypic levels. The yield was also significant and positive correlated with the length of inter node at genotypic level.

In cucumber, Abusaleha and Dutta (1988) reported that fruit yield recorded high degree of positive association with fruit number per vine (0.479 and 0.457). Whereas days to female flowering (-0.300 and -0.294) nodal position of female flower (-0.132 and -0.127) showed negative and non-significant association with yield at genotypic as well as phenotypic levels respectively. In ridge gourd, kadam *et al.*(1992) reported that yield per vine had high and positive correlation with fruits per plant, fruit weight, and vine length.

In bitter gourd, Lawande and Patil (1989) reported that the yield per vine had a positive correlation with vine length, weight of fruit and fruit number per vine both at phenotypic and genotypic levels. In bitter gourd, Kumaresan (2000) reported that the yield per vine had highly positive correlation with fruit number per vine (0.687 and 0.698) and vine length (0.364 and 0.369) while the yield had negative correlation with days to first female flower appearance (-0.308 and -0.375) both at phenotypic and genotypic levels. In another study on bitter gourd, Ram *et al* (2006) reported yield had positive and significant correlation with number of fruits per plant and average weight of fruit.

In pumpkin, Borthakur and Shadeque (1994) reported that the yield per plant exhibited significant association with main vine length, number of female flowers per plant, number of fruits per plant and weight of fruit per vine. In pumpkin, Dhatt and Hardevinder Singh.(2008) reported that the yield per plant was positively correlated with fruit weight.

In watermelon, Lalta Prasad *et al.* (1988) observed positive and significant correlation of yield with fruit weight (0.880 and 0.780) and vine length (0.470 and 0.050)

.While yield had negative and non-significant association with TSS (-0.080 and 0.000) both at genotypic and phenotypic level respectively. Singh and Singh (1988) noticed positive correlation of yield with fruit number per vine (0.952 and 0.892) and TSS (0.867 and 0.849). Whereas negative association with fruit weight (-0.807 and -0.647) and node numbers for the appearance of first female flower (-0.863 and -0.545) both at genotypic and phenotypic levels respectively in watermelon. In water melon, Saroj Rolania *et al.*(2003) reported fruit yield was positively correlated with main vine length ,number of fruits per plant and harvest duration.

A positive and significant correlation of yield with fruit number per vine (0.215), fruit weight (0.574), TSS (0.609) and days to flowering (0.518) in muskmelon at genotypic level was reported by Vijay (1987).In muskmelon, Tarsem Lal and Sanjay Singh (1997) reported highly significant and positive phenotypic correlation of flesh thickness (0.994), weight of fruit (0.837) and vine length (0.326) with yield per plant. In musk melon , Choudhary *et al.*(2003) reported fruit yield per plant had significant and positive correlation with fruit weight, fruits per plant, harvest duration and vine length. Rukam *et al.*(2008) in musk melon reported that the yield per plant positive correlation with number of fruits per plant and total soluble solids .

According to Ritu Pandey *et al.* (2006) reported yield had positive and significant correlation with number of fruits per plant and average fruit weight at phenotypic and genotypic level during both summer and rainy seasons in sponge gourd. Days to harvest first fruit showed negative and significant correlation with fruit yield during summer season at phenotypic as well as genotypic levels. Direct positive effect on fruit yield during summer was recorded with fruit weight, number of fruits per plant and duration of fruit harvest while in rainy season it was observed in fruit weight, number of fruits per plant ,duration of fruit harvest ,days to anthesis of first female flower, vine length and node number of first female flower.

In snap melon, Krishna Reddy *et al.*(2007) reported yield per plant was positively and significantly correlated with fruit weight ,vine length, fruit length, first female flower node number and length of fruit.

Direction of association	Crop	Reference
<b>2.3.1.1 Vine length (m)</b>		
Positive	Ivy gourd	Sibyvarghese <i>et al.</i> (2005)
Positive	Cucumber	Saikia <i>et al.</i> (1995)
Positive	Ridge gourd	Sahni <i>et al.</i> (1985)
Positive	Ridge gourd	Kadam <i>et al.</i> (1992)
Positive	Snake gourd	Kumaresan (2000)
Positive	Bottle gourd	Murali <i>et al.</i> (1986)
Positive	Bitter gourd	Sumathi (2001)
Positive	Pumpkin	Doijode (1994)
Positive	Muskmelon	Choudhary <i>et al.</i> (2003)
Positive	Round Melon	Samadia (2007)
Positive	Snap melon	Krishna Reddy <i>et al.</i> (2007)
<b>2.3.1.2. Days to first female flower appearance</b>		
Negative	Cucumber	Abusaleha and Dutta (1988)
Positive	Cucumber	Rashogi and Aryadeep (1990)
Positive	Cucumber	Punitha (2000)
Negative	Cucumber	Sumathi (2001)
Positive	Snake gourd	Kumaresan (2000)
Negative	Bitter gourd	Munshi and Sirohi (1994)
Positive	Bitter gourd	Geetashri Parhi <i>et al.</i> (1995)
Negative	Bitter gourd	Murlee Yadav <i>et al.</i> (2004)
Positive	Pumpkin	Nisha (1999)
Negative	Pumpkin	Mukunda Lakshmi <i>et al.</i> (2002)
Positive	Snap melon	Krishna Reddy <i>et al.</i> (2007)

Direction of association	Crop	Reference
<b>2.3.1.3 Node number at which first female flower appear</b>		
Positive	Snap melon	Krishna Reddy <i>et al.</i> (2007)
<b>2.3.1.4. Inter nodal Length (cm)</b>		
Positive	Bitter gourd	Richard Kennedy (1995)
Positive	Pumpkin	Dojode (1994)
<b>2.3.1.5. Days to first harvest</b>		
Positive	Cucumber	Rashogi and Aryadeep (1990)
Positive	Ridge gourd	Kadam <i>et al.</i> (1992)
Positive	Bottle gourd	Ahmed <i>et al.</i> (2005)
Positive	Bitter gourd	Mahendra Prasad <i>et al.</i> (1993)
Negative	Bitter gourd	Munshi and Sirohi (1994)
Negative	Bitter gourd	Thakur <i>et al.</i> (1996)
Positive	Bitter gourd	Rao <i>et al.</i> (2004)
Positive	Bitter gourd	Ram <i>et al.</i> (2006)
Positive	Sponge gourd	Ritu Pandey <i>et al.</i> (2006)
Positive	Pumpkin	Dhatt and Hardevinder Singh (2008)
Positive	Muskmelon	Mukunda Lakshmi <i>et al.</i> (2002)
Positive	Musk melon	Yadav and Hari Har Ram (2002)
Positive	Muskmelon	Choudhary <i>et al.</i> (2003)
Positive	Snap melon	Krishna Reddy <i>et al.</i> (2007)
<b>2.3.1.6. Fruit weight (g)</b>		
Positive	Cucumber	Patil and Patil (1985)
Positive	Cucumber	Abusaleha and Dutta (1988)
Positive	Cucumber	Saikia <i>et al.</i> (1995)

<b>Direction of association</b>	<b>Crop</b>	<b>Reference</b>
Positive	Cucumber	Rao <i>et al.</i> (2004)
Positive	Ribbed gourd	Sahni <i>et al.</i> (1985)
Positive	Ridge gourd	Kadam <i>et al.</i> (1992)
Positive	Bottle gourd	Ahmed <i>et al.</i> (2005)
Positive	Bitter gourd	Lawande and Patil (1989)
Negative	Bitter gourd	Munshi and Sirohi (1994)
Positive	Snap melon	Krishna Reddy <i>et al.</i> (2007)
<b>2.3.1.7. Fruit length (cm)</b>		
Positive	Cucumber	Rao <i>et al.</i> (2004)
Positive	Bottle gourd	Sharma <i>et al.</i> (1993)
Positive	Bitter gourd	Munshi and Sirohi (1994)
Negative	Bitter gourd	Puddan (2000)
Positive	Pumpkin	Nisha (1999)
Positive	Pumpkin	Mukunda Lakshmi <i>et al.</i> (2002)
Positive	Muskmelon	Yadav and Hari Har Ram (2002)
<b>2.3.1.8. Fruit girth (cm)</b>		
Positive	Ivy gourd	Sarnaik <i>et al.</i> (1999)
<b>2.3.1.9.Fruit number per vine</b>		
Positive	Ivy gourd	Sarnaik <i>et al.</i> (1999)
Positive	Ivy gourd	Sibyvarghese <i>et al.</i> (2005)
Positive	Cucumber	Rashogi and Aryadeep (1990)
Positive	Cucumber	Rao <i>et al.</i> (2004)
Positive	Ridge gourd	Kadam <i>et al.</i> (1992)
Positive	Bottle gourd	Mahendra Prasad <i>et al.</i> (1993)

<b>Direction of association</b>	<b>Crop</b>	<b>Reference</b>
Positive	Bottle gourd	Ahmed <i>et al.</i> (2005)
Positive	Bitter gourd	Lawande and Patil (1989)
Negative	Bitter gourd	Munshi and Sirohi (1994)
Positive	Bitter gourd	Richard Kennedy (1995)
Negative	Bitter gourd	Kabilar (1999)
Positive	Bitter gourd	Ram <i>et al.</i> (2006)
Positive	Sponge gourd	Ritu Pandey <i>et al.</i> (2006)
Positive	Pumpkin	Nisha (1999)
Positive	Pumpkin	Mukunda Lakshmi <i>et al.</i> (2002)
Positive	Water melon	Singh and Singh (1988)
Positive	Water melon	Saroj Rolania <i>et al.</i> (2003)
Positive	Musk melon	Choudhary <i>et al.</i> (2003)
Positive	Musk melon	Rukam <i>et al.</i> (2008)
<b>2.3.1.10. Total soluble solids (<sup>0</sup>Brix))</b>		
Positive	Watermelon	Singh and Singh (1988)
Positive	Musk melon	Rukam <i>et al.</i> (2008)

## CHAPTER III

### MATERIAL AND METHODS

The present study on evaluation of ivy gourd genotypes was carried out at the college orchard, Department of Vegetable crops, Horticultural College and Research Institute, Coimbatore during 2008-2009. A brief account on the experiment and methodology adopted for the study is dealt below.

#### 3.1. MATERIALS

A total of seven genotypes were collected from different sources and used as biological materials for this study. The details of the genotypes are furnished below.

##### Details of the source material

S.No	Genotypes	Source
1.	CG-1	Madukkarai (Coimbatore)
2.	CG-2	Tindevanum
3.	CG-3	TNAU
4.	CG-4	Palladam (Coimbatore)
5.	CG-5	Palladam (Coimbatore)
6.	CG-6	Kancheepuram
7.	CG-7	TNAU (Coimbatore)

##### 3.1.1. Field location

Latitude	:	11 <sup>0</sup> 09' N
Longitude	:	76 <sup>0</sup> 57' E
Altitude	:	426.76 m above MSL
Maximum temperature	:	34.1 <sup>0</sup> C
Minimum temperature	:	24.3 <sup>0</sup> C
Mean annual rainfall	:	650 mm
Average relative humidity	:	83.25 per cent

The weather data recorded during the crop growth period (2008-09) was obtained from Department of Agricultural Meteorology, Tamil Nadu Agricultural University, Coimbatore and are given in Annexure I.

### Field Layout of the Experiment

<b>R1</b>	<b>R2</b>	<b>R3</b>	<b>R4</b>
<b>T<sub>2</sub></b>	<b>T<sub>1</sub></b>	<b>T<sub>3</sub></b>	<b>T<sub>5</sub></b>
<b>T<sub>4</sub></b>	<b>T<sub>5</sub></b>	<b>T<sub>6</sub></b>	<b>T<sub>1</sub></b>
<b>T<sub>1</sub></b>	<b>T<sub>2</sub></b>	<b>T<sub>7</sub></b>	<b>T<sub>3</sub></b>
<b>T<sub>3</sub></b>	<b>T<sub>4</sub></b>	<b>T<sub>5</sub></b>	<b>T<sub>7</sub></b>
<b>T<sub>7</sub></b>	<b>T<sub>6</sub></b>	<b>T<sub>4</sub></b>	<b>T<sub>2</sub></b>
<b>T<sub>6</sub></b>	<b>T<sub>3</sub></b>	<b>T<sub>2</sub></b>	<b>T<sub>4</sub></b>
<b>T<sub>5</sub></b>	<b>T<sub>7</sub></b>	<b>T<sub>1</sub></b>	<b>T<sub>6</sub></b>

### 3.2. METHODOLOGY

The experiment was laid out in a RBD with four replications. The soil of the experimental field is red sandy loam in texture. The field was ploughed three times and long channels of 60 cm width were formed at a spacing of two meter .Along these channels pits of 45 cubic centimeter size were dug at spacing of two meter. The accession in each replication consists of eight pits and four rooted stem cuttings were planted in each pit. After establishment among the four cuttings one healthy plant was retained in each pit and the rest were thinned out. The required cultural operations and plant protection measures were followed as per the package of practices recommended by TNAU for ivy gourd.

### 3.3. OBSERVATIONS

Different biometrical as well as biochemical traits of the genotypes were taken for evaluation.

### **3.3.1. BIOMETRICAL CHARACTERS**

#### **3.3.1.1. Vine length (m)**

The length of the vine was measured from sprouting node to the vine tip at final harvest and expressed in meters.

#### **3.3.1.2 Days to first female flower appearance**

The day of first pistillate flower production was recorded from the date of planting.

#### **3.3.1.3. Node number at which first female flower appear**

The node at which first female flower appeared was recorded from the sprouting node.

#### **3.3.1.4. Inter nodal length (cm)**

The length of the inter node was measured between the two lengthy nodes at final harvest and expressed in centimeters.

#### **3.3.1.5. Days to first harvest**

The number of days taken from date of sowing to maturity of first harvest was counted and expressed in days.

#### **3.3.1.6. Fruit weight (g)**

Individual fruit weight was measured from each plant and replication and the mean value was expressed in grams.

#### **3.3.1.7.. Fruit length (cm)**

The fruit length from the stalk end to stylarend was measured and expressed in centimeter.

#### **3.3.1.8. Fruit girth (cm)**

The girth of the edible fruit was measured at three points along the length of the fruit and the mean was expressed in centimeters.

#### **3.3.1.9. Fruit number per vine**

The total number of fruits produced per vine was counted at the time of every harvest and expressed in number.

#### **3.3.1.10. Seed number per fruit**

The total number of seeds in each fruit was counted and their mean was expressed in number.

#### **3.3.1.11. Yield per vine (kg)**

The total weight of all the fruits from each plant harvested at different intervals was recorded and their mean values were expressed as average yield per vine and expressed in kilograms.

### **3.3.2. BIOCHEMICAL CHARACTERS**

#### **3.3.2.1. Total soluble solids (° Brix)**

The total soluble solids (TSS) of fruits was estimated using a hand refractometer and expressed in °Brix.

#### **3.3.2.2. Total carbohydrate content (g/100 g)**

The total carbohydrate content of the fruit sample was estimated at harvestable maturity stage by adopting the anthrone method and expressed as g per 100 gram.

#### **3.3.2.3. Protein content (g/100 g)**

The amount of total soluble protein present in the fruit was estimated at vegetable maturity stage by adopting Lowry's method and expressed as g per 100 gram.

#### **3.3.2.4. Crude fibre content (%)**

The amount of crude fibre present in the fruit was estimated at vegetable maturity stage by adopting the method of Chopra and Kanwar (1976) and expressed as percentage.

### **3.4. STATISTICAL ANALYSIS**

The observations recorded were subjected to statistical scrutiny. The results of the following parameters were analysed.

1. Analysis of variance
2. Variability studies
3. Heritability and genetic advance
4. Correlation studies

### **3.4.1. UNIT ANALYSIS**

The estimates of mean, variance and standard error were done as per Panse and Sukhatme (1967)

i. General mean (GM) =  $\frac{\text{Total of all values}}{n}$

Where (n) = Number of observations

ii. Variance =  $\frac{SS-CF}{DF}$

Where , SS = Sum of square of all observations of a variable.

CF= Critical Factor =  $\frac{(\text{Grand Total})^2}{n}$

DF = Degrees of freedom

iii .Standard deviation (SD) =  $\sqrt{\text{Variance}}$

iv. Standard error (SE) =  $\frac{SD}{n}$

v. Coefficient of variation (CV) =  $\frac{SD}{\text{Mean}} \times 100$

### **3.4.2. ANALYSIS OF VARIANCE (ANOVA)**

ANOVA was worked out for all the characters by making use of means of replication, as suggested by Goulden (1959) and the ANOVA table is presented below.

Source of variation	Degrees of freedom	Mean squares	F ratio
Replication	(r-1)	Mr	Mr/Me
Genotype	(g-1)	Mg	Mg/Me
Error	(r-1)(g-1)	Me	

Where,

r = Number of replications

g = Number of genotypes

Mr = Replication mean square

Mg = Genotype mean square

Me = Error mean square

The test of significance was worked out by referring to the standard 'F' table suggested by Snedecor and Cochran (1961).

### 3.4.3. VARIABILITY STUDIES

#### 3.4.3.1. Phenotypic and genotypic variance

Phenotypic and genotypic variance were estimated according to the formula of Lush (1940)

Environmental variance ( $V_e$ ) = Me

Genotypic variance ( $V_g$ ) =  $\frac{Mg - Me}{r}$

Phenotypic variance ( $V_{ph}$ ) =  $V_g + V_e$

Where,

Mg = Mean square for genotype

Me = Mean square for error

r = Number of replications

### 3.4.3.2. Phenotypic coefficient of variation and genotypic coefficient of variation

The Phenotypic coefficient of variation (PCV) and Genotypic coefficient of variation (GCV) were calculated by using the formula as suggested by Burton (1952).

$$\text{PCV} = \frac{\sqrt{\text{Phenotypic variance}}}{\text{Mean}} \times 100$$

$$\text{GCV} = \frac{\sqrt{\text{Genotypic variance}}}{\text{Mean}} \times 100$$

PCV and GCV were classified as noted below and as suggested by Sivasubramaniam and Madhava Menon (1973).

Less than 10%	=	Low
Between 10-20%	=	Moderate
More than 20%	=	High

### 3.4.4. HERITABILITY AND GENETIC ADVANCE

#### 3.4.4.1. Heritability ( $h^2$ )

Heritability ( $h^2$ ) in broad sense was calculated as per the method suggested by Lush (1940) and expressed in percentage.

$$h^2 (\text{Broad sense}) = \frac{\text{Genotypic variance}}{\text{Phenotypic variance}} \times 100$$

The heritability percentage was categorized as suggested by Robinson *et al.* (1949).

0- 30 per cent	=	Low
31-60 per cent	=	Moderate
Above 60 per cent	=	High

#### 3.4.4. Genetic Advance (GA)

Genetic advance was estimated by the method formulated by Johnson *et al.* (1955a ).

$$\text{Genetic advance (GA)} = \frac{\text{Genotypic variance}}{\text{Phenotypic standard deviation}} \times K$$

Where,

K = Selection differential (at 5 % selection intensity, K = 2.06) (Falconer, 1967).

Genetic advance was also expressed as per cent of mean.

$$\text{Genetic advance as per cent of mean} = \frac{\text{Genetic advance}}{\text{Grand mean}} \times 100$$

The genetic advance as per cent of mean was categorized as suggested by Johnson *et al.* (1955a).

Less than 10%	=	Low
Between 10-20%	=	Moderate
More than 20%	=	High

#### 3.4.5. CORRELATION STUDIES

Correlation co-efficients for yield and other traits in all seven genotypes were worked out as suggested by Johnson *et al.* (1955b).

##### 3.4.5.1. Genotypic correlation coefficient

$$r_g(xy) = \frac{\text{Cov. g}(xy)}{\sqrt{\sigma^2_{g_x} \times \sigma^2_{g_y}}}$$

Where,

$r_g(xy)$  = Genotypic correlation coefficient between the traits x and y

$Cov\ g(xy)$  = Genotypic covariance between the traits 'x' and 'y'

$\sigma^2\ g_x$  = Genotypic variance of the trait - 'x'

$\sigma^2\ g_y$  = Genotypic variance of the trait ' y'

### 3.4.5.2. Phenotypic correlation coefficient

$$r_p(x, y) = \frac{Cov. p(xy)}{\sqrt{\sigma^2 p_x \times \sigma^2 p_y}}$$

Where,

$r_p(xy)$  = Phenotypic correlation coefficient between the traits x and y

$Cov. p(xy)$  = Phenotypic covariance between the traits 'x' and 'y'

$\sigma^2\ p_x$  = Phenotypic variance of the trait - 'x'

$\sigma^2\ p_y$  = Phenotypic variance of the trait ' y'

The significance of the phenotypic and genotypic correlation coefficient was tested by referring the standard table given by Snedecor (1961).

## CHAPTER IV

### EXPERIMENTAL RESULTS

In the present study on “Evaluation of certain Ivy gourd genotypes (*Coccinia grandis* L.) for growth, yield and quality under Coimbatore condition”, the performance of seven genotypes of ivy gourd was evaluated for 15 traits. The data were analysed statistically and the results of the 15 traits are presented in this chapter.

#### 4.1. Evaluation of genotypes (Table 1)

The analysis of variance for the fifteen characters indicated that there were highly significant differences among the genotypes for most of the characters such as inter nodal length (2.98), fruit weight (63.94), fruit length (5.65), fruit girth (2.56), fruit number per vine (93124.66), number of seeds per fruit (3353.90), total soluble solids (1.86), total carbohydrate content (2.49), protein content (1.53), crude fibre (3.34) and yield per vine (62.15). Whereas the difference was significant for vine length (1.98) and node number at which first female flower appear (15.95).

The traits observed to be non significant are days to first female flower appearance (43.64) and days to first harvest (37.11).

The mean performance and co-efficient of variation of the seven genotypes for fifteen traits are furnished from Table 2 to Table 16. The general mean, range, standard error and co efficient of variation for each character is presented in Table 17.

##### 4.1.1. Vine length (Table 2 , Table 17 and fig.1)

Vine length ranged from 2.9 m to 4.85 m with a general mean of 3.89 m (Table 17). A higher vine length (4.85 m) was recorded in the genotype CG-4 followed by CG-1(4.5) and the lower value (2.9 m) was observed in the genotype CG-7. The genotype CG-3 (4.3 m) and CG-2 (3.91 m) exceeded the mean vine length of 3.89 m for vine length (Table 2).

The CV ranged between 10.46 per cent and 28.93 per cent with a mean CV of 21.17 per cent. The highest CV was showed by CG-4 and the lowest CV value was recorded by CG-2 (Table 17). The genotype CG-4(28.93 %), CG -7 (26.97 %), CG-5

(22.61%) and CG-1 (22.61 %) also registered higher CV over mean for vine length (Table 2).

#### **4.1.2. Days to first female flower appearance (Table 3, Table 17 and fig.2)**

Days to first female flower was lowest in CG-1 (46.75 days ) followed by CG-4 (47 days) and CG-5 (48.5 days) .Whereas the genotype CG-3 (51.5 days), CG-2(52 days) ,CG-7 (53.5 days) and CG-6 (54.25 days) showed later appearance of first female flower.

The genotypes viz., CG-2 and CG-1 expressed lower CV values (6.01 and 6.02 % respectively). While CG-4 registered the highest CV (12.09 % ).The mean CV among seven genotypes was 8.83 per cent. (Table17).

The genotypes CG-3(11.01 %), CG-5(10.45 % ) and CG-6 (9.09 %) surpassed the mean CV of 8.83 per cent for this trait.

#### **4.1.3. Node number at which first female flower appear (Table 4, Table 17 and fig.3)**

The mean for this trait varied from 22.25 to 28.75 with a general mean of 26.28. (Table17). The genotype CG-3 produced the first female flower in the earlier node (22.25) followed by CG-1 (25.75), CG-4(26.5), CG-6 (26.75), CG-7(27) and CG-2(27).While CG-5 produced the female flower in the later node (28.75).

The higher value of CV observed in the genotype CG-2 (17.37 %), while CG-5 recorded lower value (3.3 %) and the mean CV was 9.29 per cent (Table.4). The genotype CG-4 (9.96 %), CG-3 (9.93 %) and CG-1 (9.70 %) have registered higher CV values over the mean for this trait.

#### **4.1.4. Inter nodal length (Table 5, Table 17 and fig.4)**

The length of inter node varied from 7.0 cm to 9.2 cm with a general mean of 8.1 cm (Table 17).The highest inter node length was recorded in CG-5 (9.2 cm) followed by CG-2 (9 cm) and the lower values (7 cm and 7.1 cm) were noticed in CG-3 and CG-7.The genotype CG-4 (8.5 cm) exceeded the mean value of 8.1 cm for this trait .The CV ranged between (4.92 and 16.31 % respectively) with a mean CV of

8.62 per cent .The highest CV observed in followed by CG-6 and the lowest was observed in the genotype CG-2 . (Table 5).

#### **4.1.5. Days to first harvest (Table 6, Table 17 and fig.5)**

The genotype CG-4 was observed to be earlier to harvestable maturity (52.75 days).Whereas the genotype CG-6 was late (61.5 days) and was closely followed by CG-2 (59.25 days) and CG-7 (58.5 days).

The CV for this trait varied from 4.45 to 12.71 per cent and the mean CV was observed to be 8.34 per cent. The low CV of 4.45 per cent was noticed in the genotype CG-1, while high CV recorded in the genotypes CG-7(12.71 %), CG-6 (10.56 %), CG-5 (9.89 %) and CG-2 (8.85 %) over the mean CV.(Table 6).

#### **4.1.6. Fruit weight (Table 7 and Table 17)**

The genotype CG-5 registered the highest weight of fruit 19.96 g and which was closely followed by CG-4 19.45g. However, the genotype CG-7 exhibited the lowest value (9.43 g) compared to over all mean value of 15.41 g. The genotype CG-1 (18.77 g) recorded high value of fruit weight over the mean value. (Table7).

The CV value varied from 6.49 per cent in the genotype CG-1 to 24.9 per cent in the genotype CG-3. High CV value were also noticed in the genotype CG-6 (23.86 %) followed by CG-2 (17.52 %) over the mean CV. The CV values were on par among the genotypes CG-1 and CG-5 (6.49 and 6.87 % respectively).

#### **4.1.7. Fruit length (Table 8, Table 17 and fig.6)**

The value for this trait varied from 4.60 cm to 8.05 cm with a mean of 6.06 cm. The increased length (8.05 cm) was registered in the genotype CG-4.While in CG-7 the lowest length (4.60 cm) was recorded (Table17).

The CV varied from a lower value of 7.38 per cent in the genotype CG-1 to a higher value of 12.83 per cent in the genotype CG-3 and the mean was 9.08 (Table 8).The CV values were on par among the genotypes CG-4,CG-7 and CG-6 (8.33,8.61 and 8.91 % respectively).

#### **4.1.8. Fruit girth (Table 9 and Table 17)**

The mean value for this trait varied from 5.75 to 7.82 cm with a mean of 6.60 cm. (Table 17). The maximum fruit girth was registered in the genotype CG-1 and the lower value in the genotype CG-7. The mean CV varied from a lower value of 5.45 percent in the genotype CG-5 to a higher value of 7.02 per cent in the genotype CG-4 and the mean CV was 6.15 per cent.

The CV values were on par among the genotypes CG-5, CG-2, CG-7 and CG-3 (5.45, 5.83 and 5.87 % respectively). (Table 9).

#### **4.1.9. Fruit number per vine (Table 10, Table 17 and fig.7)**

Fruits were ranged from 763.5 to 1171 with a mean of 988.25 (Table 17). The fruit number was highest in the genotype CG-3 followed by CG-1 (1124) and the lower value registered in the genotype CG-5.

The CV varied from the lowest value of 4.89 per cent in the genotype CG-1 to highest value of 14.83 per cent in CG-5 and the mean CV was 9.17 per cent. The CV of CG-3 and CG-6 were on par with each other (7.76 and 7.62 % respectively).

#### **4.1.10. Number of seeds per fruit (Table 11 and Table 17)**

The value among the genotype for this trait varied from 111 to 192 with a mean of 149.8 (Table 17). The higher value was registered by the genotype CG-4 followed by CG-6 (123) and the lower seed number (111) was observed in the genotype CG-7. The mean CV varied from lower value of 8.81 per cent in the genotype CG-4 to a higher value of 21.44 per cent in CG-5 and the mean CV was 16.35 per cent.

#### **4.1.11. Total Soluble Solids (Table 12, Table 17 and fig.8)**

This trait varied from 2.3 ° Brix in CG-2 to 4.5 ° Brix in CG-3 among the genotypes with a mean of 3.13 ° Brix. The genotypes CG-5 (3.3 ° Brix) and CG-4 (3.2 ° Brix) registered higher values for this trait. The TSS values of CG-1 and CG-6 were on par with each other (2.85 ° Brix) (Table 17).

A higher CV was recorded in CG-2 (23 %). While CG-3 recorded the low CV (6.44 %) compared to a mean CV of 14.23 per cent (Table 12). The CV values were on par in the genotypes CG-4 and CG-6 (15.02 and 15.75 % respectively).

#### **4.1.12. Total carbohydrate (Table 13 and Table 17)**

Total carbohydrate content varied from 2.67g in the genotype CG-6 to 5.10 g in CG-5 with a mean of 3.77g (Table 17). The genotypes viz., CG-7, CG-6, CG-2 and CG-3 were on par with each other (3.25, 3.30, 3.30, 3.87 and 3.98 g respectively). A highest CV of 27.21 per cent was noticed in CG-1. A low of 10.45 per cent in CG-7 compared to a mean CV of 16.68 per cent (Table 13).

#### **4.1.13. Protein content (Table 14, Table 17 and fig. 9)**

Protein content varied from 3.24 to 5.10 with a mean of 4.11 (Table 17). A highest protein content of 5.1 g was registered in the genotype CG-4 and it was lowest (3.24 g) in the genotype CG-2. The mean CV varied from a lower value of 8.82 per cent in the genotype CG-4 to a higher value of 20.55 per cent in the genotype CG-1 and the mean CV was 13.56 per cent. (Table 14). The CV values were on par in the genotypes CG-2 and CG-5 (15.89 and 15.49 % respectively).

#### **4.1.14. Crude fibre (Table 15 and Table 17)**

Crude fibre content varied from 1.48 to 4.17 per cent with a mean of 2.68 per cent (Table 17). A highest crude fiber of 4.17 per cent was noticed in the genotype CG-1 and it was lowest in the genotype CG-4 (1.48 %).

The CV varied from a lower value of 7.01 per cent in the genotype CG-1 to a higher value of 20.13 per cent in the genotype CG-7 and the mean CV was 12.41 per cent (Table 15). The CV values were on par in the genotypes CG-1 and CG-5 (7.01 and 7.55 % respectively) and also in CG-2 and CG-6 (12.11 and 12.09 % respectively).

#### **4.1.15. Yield per vine (Table 16, Table 17 and fig. 10)**

Yield per vine varied from 10.63 kg to 21.29 kg with a mean of 15.19 kg (Table 17). The genotype CG-1 recorded a higher yield (21.29 kg) and which was

closely followed by CG- 4 (19.14 kg ). The lowest yield was recorded in the genotype of CG- 7.

CV varied from a lower value of 8.08 per cent in the genotype CG 3 to a higher value of 16.9 per cent in CG-7 and the mean CV was 11.01 per cent (Table 16).

#### **4.2. Variability (Table 18, Table 19 fig.11)**

Variability for fifteen traits was estimated on the basis of phenotypic and genotypic variances and phenotypic and genotypic coefficients of variation. A perusal of Table 18 and Table 19 showed that in general all the characters expressed higher values for phenotypic variances and phenotypic coefficients of variation than their corresponding genotypic values.

Higher values of phenotypic variances (PV) were recorded in the traits viz., fruit number per vine (30188.14), number of seeds per fruit (1289.03), days to first harvest (26.23), days to first female flower appearance (24.35), fruit weight (19.40) and yield per vine (17.63) .While low phenotypic variances were observed for total soluble solids (0.61), protein content (0.62) , fruit girth (0.76), total carbohydrate (0.92) and crude fibre (0.92) .

High genotypic variance (GV) was recorded for certain traits viz., fruit number per vine (20978.84), number of seeds per fruit (688.29), fruit weight (14.84) and yield per vine (14.83). Whereas it was low for protein content (0.30), vine length (0.32), total soluble solids (0.41), total carbohydrate content (0.52), fruit girth (0.60), internodal length (0.62) and crude fibre (0.80).The environmental variance (EV) was high for the traits such as fruit number per vine (9209.30), number of seeds per fruit (600.74), days to first harvest (22.610), days to first female flower appearance (19.89). While low environmental variance was recorded for crude fibre (0.11), fruit girth (0.160, total soluble solids (0.19), fruit length (0.29), protein content (0.32), total carbohydrate content (0.39), internodal length (0.48) and vine length (0.67).

Both the phenotypic and genotypic co-efficient of variation were higher for certain traits viz., crude fibre (35.71 and 33.48 % respectively), yield per vine (27.62 and 25.34 % respectively), fruit weight (28.56 and 24.98 % respectively), total soluble

solids (25.04 and 20.60 % respectively), total carbohydrate content (25.42 and 19.18 % respectively) and vine length (25.82 and 14.78 % respectively). Moderate phenotypic and genotypic coefficient of variation were registered for fruit girth (13.25 and 11.73 % respectively), fruit number per vine (17.58 and 14.65 % respectively) and protein content (19.17 and 13.37 % respectively). Whereas low phenotypic and genotypic coefficient of variation were registered for days to first female flower appearance (9.77 and 4.18 % respectively) and days to first harvest (8.99 and 3.34 % respectively).

Environmental co-efficient of variation (ECV) was high for vine length (21.17 %), number of seeds per fruit (16.35 %), total soluble solids (14.23 %), fruit weight (13.84 %), protein content (13.56 %) and crude fibre (12.41 %). Whereas it was low for fruit girth (6.15 %), days to first harvest (8.34 %), inter nodal length (8.62 %), days to first female flower appearance (8.83 %), fruit length (9.08 %), node number at which first female flower appear (9.29 %) and fruit number per vine (9.71 %).

#### **4.3. Heritability and genetic advance (Table 20 and fig. 12 )**

Heritability and genetic advance estimates were assessed for 15 characters. These estimates were high for the traits such as crude fibre (87 %), yield per vine (84 %), fruit length (82 %), fruit girth (78 %), fruit weight (76%), fruit number per vine (69 %) and total soluble solids (67 %).

Moderate heritability was recorded for inter nodal length (56 %), total carbohydrate content (56 %), number of seeds per fruit (53 %), protein content (48 %) and vine length (32 %). Low heritability was noticed for node number at which first female flower appear (29 %), days to first female appearance (18 %) and days to first harvest (13 %).

The genetic advance as per cent of mean was high for crude fibre (64.68 %), yield per vine (47.88 %), fruit weight (45.02 %), fruit length (36.49 %), total soluble solids (34.93 %), total carbohydrate content (29.80 %), number of seeds per fruit (26.35 %), fruit number per vine (25.16 %) and fruit girth (21.41 %).

Moderate genetic advance as per cent of mean was registered for protein content (19.22 %), vine length (17.43 %) and inter nodal length (15.06 %). Low genetic advance as per cent of mean was noticed for node number at which first female flower appear (3.68 %) and days to first harvest (2.56 %).

#### **4.4. Correlation studies (Table 21)**

The genotypic correlation co-efficient estimates between yield and yield component characters and inter correlation among different yield components are furnished in Table 21.

Among the 15 traits, vine length (1.153), days to first harvest (1.362), fruit girth (1.048) and number of seeds per fruit (1.070) exhibited positive correlation and highly significant with yield at genotypic level. Whereas fruit weight (0.800) expressed positive correlation and significant with yield at genotypic level. While days to first female flower appearance has showed highly significant but negative correlation (-1.333). The traits, such as inter nodal length (0.173), fruit length (0.515), fruit number per vine (0.444), total soluble solids (0.226), total carbohydrate content (0.261), protein content (0.687), and crude fiber (0.255) exhibited non significant but positive correlation with yield at genotypic level. Non significant and negative correlation was recorded for the trait node number of at which first female flower appearance (-0.467).

##### **4.4.1. Association among yield components (Table 21)**

Vine length exhibited positive and highly significant association with fruit girth (1.018) and number of seeds per fruit (1.232). While it exhibited negative and highly significant correlation with days to first female flower appearance (-1.291) and days to first harvest (-1.686). It also exhibited non significant negative correlation with node number at which first female flower appear (-0.686) but positive correlation with inter nodal length (0.295), fruit length (0.563), fruit number per vine (0.585), total soluble solids (0.291), protein content (0.579) and crude fibre (0.060).

Days to first female flower appearance exhibited positive and highly significant correlation with days to first harvest (1.921). It showed negative and highly significant association with fruit weight (-1.311), fruit length (-1.061), fruit

girth (-1.379), number of seeds per fruit (-1.727) and protein content (-1.117). Whereas positive and non significant association was observed for node number at which first female flower appear (0.233). Negative and non significant correlation was observed for inter nodal length (-0.719), fruit number per vine (-0.040), total soluble solids (-0.147), total carbohydrate (-0.675) and crude fibre (-0.026).

Node number at which first female flower appear showed positive and significant association with inter nodal length (0.834). It exhibited negative and highly significant correlation with fruit numbers per vine (-1.004) and total soluble solids (-1.049). Whereas positive but non significant association was observed for days to first female flower appearance (0.173), fruit weight (0.361), fruit length (0.279), total carbohydrate content (0.141). While negative and non significant relationship was noticed in fruit girth (-0.322), number of seeds per fruit (-0.097), protein content (-0.323) and crude fibre (-0.105).

Inter nodal length exhibited negative but significant relationship with fruit number per vine (-0.857\*), whereas positive and non significant correlation was observed for fruit weight (0.711), fruit length (0.705), fruit girth (0.131), number of seeds per fruit (0.4670), total carbohydrate content (0.667) and crude fibre (0.106). While negative and non significant association observed for days to first harvest (-0.258), total soluble solids (-0.554) and protein content (-0.384).

Days to first harvest exhibited negative and highly significant association with fruit weight (-1.200), fruit length (-1.119), fruit girth (-1.470), number of seeds per fruit (-1.666), total carbohydrate (-0.823) and protein content (-1.561). It also showed negative and non significant correlation with fruit number per vine (-0.297) and positive correlation with crude fibre (0.241).

Fruit weight showed positive and highly significant association with fruit length (0.886) and number of seeds per fruit (1.058). It also showed positive non significant relationship with total soluble solids (0.087), total carbohydrate (0.658), protein content (0.361) and crude fibre (0.124).

Fruit length showed positive and significant correlation with number of seeds per fruit (0.796).Where as positive and highly significant correlation with total carbohydrate (0.961).It has showed negative non significant association with fruit number per vine (-0.329) and crude fibre (-0.076).While positive non significant correlation was observed for fruit girth (0.627), total soluble solids (0.332) and protein content (0.178).

Fruit girth exhibited positive and highly significant association with number of seeds per fruit (1.019).It showed positive and non significant relationship with fruit number per vine (0.424),total soluble solids (0.360), total carbohydrate content (0.353), protein content (0.682) and crude fibre (0.211).

Fruit number per vine showed positive and non significant association with number of seeds per fruit (0.690), total soluble solids (0.171), protein content (0.748 ) and crude fibre (0.124). It also showed negative and non significant association with total carbohydrate (-0.129).

Number of seeds per fruit exhibited positive but non significant correlation with total soluble solids (0.251),total carbohydrate content (0.592) and protein content (0.677).While it showed negative and non significant correlation with crude fibre (-0.010).

Total soluble solids exhibited positive but non significant correlation with total carbohydrate (0.376) and protein content (0.532). It showed negative and non significant correlation with crude fibre (0.285).

Total carbohydrate showed positive but non significant correlation with protein content (0.174) and non significant negative correlation with crude fibre (-0.501).

Protein content exhibited negative and non significant correlation with crude fibre (-0.483).

## CHAPTER V

### DISCUSSION

Ivy gourd is one of the important under utilized cucurbitaceous crop and is grown in Eastern & Southern parts of India mainly for its consumption and medicinal value. In this important crop, so far, very little attention has been paid for its improvement in India. Very few cultivars are under cultivation, which are either introduction or selection from the local types. Recently, some varieties have been developed and are under cultivation. However, there are differences in the performance of cultivars according to the agro climatic conditions. There is a need to develop an ideal variety suited to varied agro climatic conditions with higher yield and better quality characteristics.

Amelioration of yield and quality in any crop improvement programme has to be activated through gaining insight into the behaviour of component characters that are associated with it. This is mainly due to the fact of linear association of two characters. The underlying genetic mechanism causing such association may be due to linkage and pleiotropy. With this background, the present study was undertaken to assess the variability understand the correlation and to identify suitable genotypes for yield and quality.

The present investigation was carried out to evaluate the ivy gourd genotypes, collected from different sources for growth and yield. It encompasses seven genotypes of ivy gourd collected from diverse source and maintained at the Department of Vegetable Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. The superiority of genotypes was measured with the help of the mean performance and variability is measured through genetic parameters viz., phenotypic and genotypic coefficient of variation. Correlations were studied to have a clear understanding about association of different traits with yield and the inter association among the yield components. The results obtained are discussed here under.

### 5.1. Evaluation on the mean performance of ivy gourd genotypes

Mean performance serves as an important criterion in eliminating the undesirable types in a selection programme. The present work on ivy gourd genotypes highlights significant differences among the genotypes for growth, yield and biochemical constituents and it was evident that with little prior selection for the traits of horticultural interest, the germplasm source might offer good potentiality for generating high yielding genotypes.

In the present study, the mean performance of the genotypes for various traits was assessed and taking into consideration of the mean value of the traits, the following grouping could be arrived

<b>Characters</b>	<b>Genotypes</b>
Higher vine length (m)	G-4,CG-1 and CG-3
Earliness in first female flower appearance	CG-1,CG-4 and CG-5
Earlier node number at which first female flower appear	CG-3,CG-1,CG-4 and CG-6
Lesser inter nodal length (cm)	CG-3,CG-7,CG-6 and CG-1
Lesser days to first harvest	CG-4,CG-1 and CG-5
Increased fruit weight (g)	CG-5,CG-4 and CG-1
Increased fruit length (cm)	CG-4, CG-5 and CG-1
Increased fruit girth (cm)	CG-1, CG-4 and CG-3
Higher fruit number per vine	CG-3, CG-1 and CG-7
Higher number of seeds per fruit	CG-7, CG-6, CG-2 and CG-3
High total soluble solids (° Brix)	CG-3,CG-5 and CG-4
High total carbohydrate content (g /100 g)	CG-5, CG-4 and CG-3
High Protein content (g /100 g)	CG-4, CG-1,CG-3 and CG-7
High crude fibre (%)	CG-1, CG-6 and CG-2
Greater yield per vine (kg)	CG-1, CG-4 and CG-3

In general for cucurbitaceous crops and specifically for ivy gourd the traits such as the vine length, node number at which first female flower appear, days to first female flower appearance, days to first harvest, fruit number per vine, fruit weight, total soluble solids, yield per vine are reckoned as important traits in a selection programme.

According to Gilbert (1958) parents with high order performance would be useful to produce better genotypes and in the present study, based on the order of performance of the genotypes, CG-4, CG-1 and CG-3 were distinguished from other genotypes. They showed distinctly different expressions for the traits indicated.

The genotype CG-4 exhibited its superiority for vine length, days to first female flower appearance, days to first harvest, fruit weight, fruit length and protein content. These findings are in accordance with the earlier works of El.Shawaf and Bager (1981) in pickling cucumber in which days to first female flower appearance was less. Similarly, higher fruit length produced in ivy gourd (Indira kundru-35) was reported by Sarnaik *et al.*(1999). Suchithra and Haribabu (2007) in bottle gourd reported that certain varieties (Ganesh, Avinasi Local, Arka Bhahar and NLG Long) produced lengthy vine and long fruits. Similarly, higher fruit weight in bitter gourd (PDM × AH) was reported by Suri Babu *et al.*(1986).

In the present study, the genotype CG-4 recorded earlier days for maturity. This finding clearly indicated that this genotype could be exploited as a short duration type.

Similarly, the genotype CG-3 expressed its superiority through production of first female flower in earlier node with lesser inter nodal length, higher fruit number per vine and high total soluble solids. These results are in conformity with the findings of Suri Babu *et al.* (1986) in bitter gourd (AH×TPT –L) which produced the first female flower in earlier node. Samadia (2007) reported higher number of fruits per vine, earlier node number for first female flower production with early flower maturity in round melon (AHRM1). Similarly, Ratna Prabha *et al.* (2007) reported earlier node number for first female flower production, higher fruit number per vine and high total soluble solids in ridge gourd (PHS 10).

In another study, increased fruit girth in round melon (KCM/BKP 06) was reported by Samadia (2007). In a study by Ratna Prabha *et al.* (2007) in ridge gourd, the hybrid (Jaipur Long × Chitrada) produced greater yield per vine. Similar results in the ivy gourd genotype CG-1 have been observed in the present study.

The evaluation among genotypes in the present study, thus led to the identification of CG-4, CG-1 and CG-3 as potential genotypes for the future utilization.

## **5.2. Variability**

Genetic variability is the plant breeders stock in trade without which breeders are powerless to develop a new variety in any crop. It is highly essential to ascertain to what extent the performance observed was determined by genetic causes, for which the estimation of genetic variability is necessary. The extent of genetic variability is more important than the total variation since greater the genetic variability wider would be the scope for selection. Variability is measured by phenotypic and genotypic variance and their coefficient of variation.

In the present study, the analysis of variance revealed significant differences among the genotypes in respect of all the characters studied except for days to first female flower appearance and days to first harvest. A wide range of variability was noticed for inter nodal length, fruit weight, fruit length, fruit girth, fruit number per vine, number of seeds per fruit, total soluble solids, total carbohydrate content, protein content, crude fibre and yield per vine.

In general, the phenotypic variance (PV) was higher than the genotypic variance (GV) for all the characters under study. For most of traits the genotypic component of variance was larger than the environmental component, which implied that the phenotypic variability was a reliable measure of genotypic variability. As the variances are measured with units, they would not give the relative influence of genetic and non genetic factors among the various components so as to make an unbiased comparison of the variability of different populations or among the characters of the same population. In such a situation the appropriate statistical tool that can be used is genotypic coefficient of variation (GCV). The genotypic

coefficient of variation (GCV) measures the extent of variation present in a character and help to compare the variation present in various characters.

The high Phenotypic coefficient of variation and genotypic coefficient of variation expressed by yield per vine and fruit weight, in the present study indicated that these characters exhibited wider genetic variability among the genotypes, which could be exploited for crop improvement through selection. These findings are in accordance with the finding of Suchitra and Haribabu (2007) in bottle gourd, Varalakshimi *et al.* (1995) in ridge gourd, Sathyanarayana Reddy and Rama Rao (1984) in ribbed gourd, Dhatt and Hardevinder Singh (2008) in pumpkin, Rakhi and Rajamony (2003) in muskmelon and Rukam *et al.* (2008) in musk melon. Similar results on yield per vine were also reported by Yadav *et al.* (2004) in bitter gourd, Ananthan *et al.* (2005) in bottle gourd, Ahmed *et al.* (2005) in bottle gourd and Ratna Prabha *et al.* (2007) in ridge gourd .

Moderate phenotypic and genotypic coefficient of variation were observed for fruit girth, fruit number per vine and protein content .This was in corroboration with the findings of Rakhi and Rajamony (2005) in muskmelon, Rukam *et al.* (2008) in cucumber for fruit girth and Ashish Kumar *et al.* (2008) in cucumber for fruit number per vine.

In the present study, low estimate of phenotypic and genotypic coefficient of variation observed for days to first female flower appearance and days to first harvest. Similar results have been reported by Torkadi *et al.* (2007) in musk melon, Ashish Kumar *et al.*(2008) in cucumber for days to first female flower appearance. Rukam *et al.* (2008) in musk melon and Ahmed *et al.* (2005) in bottle gourd also reported similar findings for days to first harvest .

In this study, the coefficient of phenotypic and genotypic variance in respect of all the characters differ much in their magnitude suggesting that the characters provide scope for selection based on above criteria.

### **5.3. Heritability and genetic advance**

It may be possible to estimate heritable variation with the help of GCV alone. The characters exhibit a wide range of expressions, may be controlled by many genes

and exercising selection for such character should not be merely on the consideration of phenotypic variability and in such situation, estimating the heritable portion of the characters will be of much value. The effectiveness of selection can be enhanced if the characters are highly heritable and the estimates of heritability (Broad sense) help to assess the heritable portion of the variation.

In this experiment, the characters namely fruit weight, fruit length, fruit girth, fruit number per vine, total soluble solids, crude fibre and yield per vine exhibited higher values of genetic advance as per cent of mean along with higher estimates of heritability. It may be due to predominance of additive gene effects. This is in consonance with earlier works of Ashish Kumar *et al.* (2008) in cucumber for fruit length, fruit width, yield per vine and fruit number per vine.

Similarly, Torkadi (2008) reported for fruit weight, fruit length fruit number per vine and total soluble solids in musk melon, Ahmed *et al.* (2005) in bottle gourd for all the above characters except for total soluble solids and crude fibre. Traits like days to first female flower appearance, node number at which first female flower appear and days to first harvest had low genetic advance coupled with low heritability. Similar results were reported by Sathyanarayana Reddy and Rama Rao (1984) in ribbed gourd for days to first harvest. This suggested that they were under control of non-additive gene action. The low heritability obtained might be due to the unfavourable influence of environment, rather than genetic constitution and offer little scope for selection.

From the above discussion, it could be concluded that selection based on the characters like fruit weight, fruit length, fruit girth, fruit number per vine, total soluble solids, crude fibre and yield per vine having high heritability along with high genetic advance as per cent of mean may bring about desirable improvement in yield of the ivy gourd genotypes.

#### **5.4. Correlation**

The ultimate goal of crop improvement in ivy gourd is to achieve a higher level of fruit yield. Being a complex trait, the fruit yield is largely influenced by many component characters. So information on strength and direction of

correlation of these component characters on fruit yield and inter association among them would be useful in designing breeding programmes for yield improvement. The relationship between yield and its component characters is likely to vary according to the genetic material used, environment under which the material is evaluated as well as due to interaction of these factors. Therefore it is worthwhile to study the heritable association between variables (genotypic correlation) for identification of important yield components so that due weightage can be given to the characters of importance in further selection programme. (Johnson *et al.*, 1955b).

In the present investigation, genotypic correlation coefficient was higher than the phenotypic correlation coefficient thus revealing a strong association at genotypic level between the characters.

#### **5.4.1. Correlation between fruit yield and its component characters**

The genotypic coefficient of variation worked out among different characters with fruit yield revealed that out of fifteen characters studied, only five characters viz., Vine length, days to first harvest, fruit weight, fruit girth and number of seeds per fruit recorded positive and significant association with fruit yield. Similar results of positive association of vine length was quoted by Joseph (1999) and Sarnaik *et al.* (1999) in ivy gourd, Singh *et al.* (1985) in ridge gourd and Saroj Rolania *et al.*(2003) in water melon. Similarly positive association of fruit weight with fruit yield observed in the present study is in affirmation with the works of Sibyvarghese *et al.* (2005) in ivy gourd ,Ram *et al.*(2006) in bitter gourd and Ritu Panday *et al.*(2006) in sponge gourd.

#### **5.4.2. Inter correlation among yield component**

The inter association of component characters for yield may provide the likely consequences of selection for simultaneous improvement of desirable characters. The inter correlation of days to first female flower appearance with days to first harvest revealed positive and highly significant association. This results is in agreement with the results of Daljit Singh and Nandpuri (1978) in muskmelon, Saroj Rolania *et al.* (2003) in watermelon. However, in the present study, days to first harvest exhibited negative and non significant association with fruit number per vine.

This result is in conformity with the finding of Saroj Rolania *et al.*(2003) in water melon.

In the current study, vine length had negative but highly significant association with days to first female flower appearance. Contrary to this, vine length with days to first female flower appearance had positive and highly significant association as observed by Saroj Rolania *et al.* (2003) in water melon. Whereas vine length had negative and non significant association with node number at which first female flower appear. This finding was in conformity with the finding of Bharathi (2005) in spine gourd.

The inter nodal length had negative and non significant association with days to first harvest. This finding was in accordance with the work of Saroj Rolania *et al.* (2003) in water melon. Whereas inter nodal length had negative but significant association with fruit number per vine. This result also was in conformity with the finding of Bharathi (2005) in spine gourd.

The days to first female flower appearance had negative and non significant association with inter nodal length and fruit number per vine. This result was in conformity to the finding of Bharathi (2005) in spine gourd.

The days to first female flower appearance had negative and non significant association with fruit number per vine. This finding was in corroboration with the study of Ritu Pandey *et al.* (2006) in sponge gourd.

The fruit weight had negative and non significant association with fruit number per vine, which was in agreement with Ram *et al.* (2006) in bitter gourd.

The fruit weight had positive and highly significant association with fruit length. This was confirmed by Ahmed *et al.* (2005) in bitter gourd. Whereas, fruit length had negative and non significant association with fruit number per vine, which has already been confirmed by Ritu Pandey *et al.* (2006) in sponge gourd.

The characters such as vine length, days to first harvest, fruit weight, fruit girth and number of seeds per fruit, which had significant correlation among themselves, also showed significant correlation with yield. Among the 15 traits

studied, the days to first female flower appearance showed negative but significant correlation with yield and other traits. Whereas except days to first female flower appearance, other characters have registered positive and significant correlation with yield and other traits.

In the breeding programme directed towards improving many traits simultaneously, characters showing positive and significant correlation with yield and between them would be considered desirable. In the present study, the correlation and inter correlations highlighted the prominent role of certain traits such as vine length, days to first harvest, fruit weight, fruit girth and number of seeds per fruit. Thus, it can be concluded that exercising selection for these traits in the high ranking three genotypes viz.,CG-4, CG-1 and CG-3 would bring about identification and release of a new variety in future.

## CHAPTER VI

### SUMMARY

Investigations were carried out on yield and quality of seven genotypes of ivy gourd at the orchard, Department of Vegetable Crops, Horticultural College and Research Institute, Coimbatore, during 2008-2009. The genetic analysis to assess the variability, heritability and genetic advance as per cent of mean and correlation studies were carried out utilizing the data recorded on length of vine, days to first female flower appearance, node number at which first female flower appear, inter nodal length, days to first harvest, fruit weight, fruit length, fruit girth, fruit number per vine, number of seeds per fruit, total soluble solids, total carbohydrate content, protein content, crude fibre and yield per vine.

1. Significant differences were observed among the genotypes for all the fifteen characters studied highlighting a wide range of variability existing among them. Analysis of variance indicated highly significant differences for the traits such as inter nodal length (2.98), fruit weight (63.94), fruit length (5.65), fruit girth (2.56), fruit number per vine (93124.66), number of seeds per fruit (3353.90), total soluble solids (1.86), total carbohydrate content (2.49), protein content (1.53), crude fibre (3.34) and yield per vine (62.15).
2. CG-4 exhibited superior expression for most of the economic traits such as vine length (4.85m), earlier days to first female flower appearance (47), earlier days to first harvest (52.75), higher fruit weight (19.45g), increased fruit length (8.05cm) and increased protein content (5.10g).
3. CG-3 produced early node (22.25) (at which first female flower appeared), lesser inter nodal length (7cm), higher fruit number per vine (1171) and high total soluble solids (4.5 °Brix).
4. CG-1 also excelled in certain economic traits viz., earlier days to first female flower appearance (46.75), increased fruit girth (7.82 cm), increased crude fibre (4.17g) and greater yield per vine (21.29 kg).

5. CG-5 also has superior expression for some traits such as higher fruit weight (19.95g) and increased total carbohydrate content (5.10g).
6. CG-7 expressed very less number of seeds per fruit (111). While CG-4 has the highest number of seeds per fruit (192)
7. In variability studies, the traits viz., crude fibre (35.71 and 33.48 % respectively), yield per vine (27.62 and 25.34 % respectively), fruit weight (28.56 and 24.98 % respectively) ,total soluble solids (25.04 and 20.60 % respectively) ,total carbohydrate content (25.42 and 19.18 % respectively) and vine length (25.82 and 14.78 % respectively) showed higher estimates of PCV and GCV respectively. These characters offer much scope for improvement of the crop by selection.
8. Heritability estimates were high for crude fibre (87%), yield per vine (84%), fruit length (82%), fruit girth (78%), fruit weight (76%), fruit number per vine (69%) and total soluble solids (67%).
9. Among seven genotypes, genetic advance as per cent of mean recorded high for certain traits viz., crude fibre (64.68%), yield per vine (47.88%), fruit weight (45.02%), fruit length (36.49%), total soluble solids (34.93%), total carbohydrate content (29.80%), number of seeds per fruit (26.35%),fruit number per vine (25.16%) and fruit girth (21.41%).
10. High heritability coupled with high genetic advance as per cent of mean recorded for the traits such as crude fibre (87 and 64.68 % respectively), yield per vine (84 and 47.88 % respectively), fruit length (82 and 36.49 % respectively), fruit weight (76 and 45.02 % respectively), fruit number per vine (69 and 25.16 % respectively) and fruit girth ( 78 and 21.41% respectively).
11. The characters such as mean vine length (1.153\*\*), days to first harvest (1.362\*\*), fruit girth (1.048\*\*) and number of seeds per fruit (1.070\*\*) exhibited positive and highly significant association, whereas fruit weight (0.800\*) exhibited positive and significant correlation with yield at

genotypic level. While days to first female flower appearance showed highly significant and negative correlation (-1.333).

12. Among the yield components close inter relationship and significant association was observed for vine length with fruit girth (1.018) and number of seeds per fruit (1.232), fruit weight with fruit length (0.886) and number of seeds per fruit (1.058), fruit length with total carbohydrate (0.961) and fruit girth with number of seeds per fruit (1.019).
13. Higher fruit number per kg of fruits noticed in the genotypes viz., CG-3 (71.40), CG-1 (52.79) and CG-4 (51.81). Seed number per fruit was found to be less in the genotypes viz., CG-1 (9291.04), CG-4 (9947.52) and CG-3 (10638.6).
14. From the findings of the present study, a selection index on fruit weight, fruit length, fruit number per vine and days to first harvest could be suggested for selection of a genotype with high yield potential in ivy gourd.
15. The present study on the evaluation of genotypes based on the mean performance showed that the genotypes viz., CG-1, CG-4 and CG-3 have ranked top for most of the economic traits under Coimbatore condition. Hence, selection can be exercised on these three genotypes in the breeding programme which would bring about identification and release of a new variety in future.

## REFERENCES

- Abusaleha and O.P. Dutta. 1988. Inter relationship of yield components in cucumber. **Veg. Sci.**, **15**(1): 79-85.
- Abusaleha, J.N. and O.P. Dutta. 1990. Studies on variability, heritability and scope of improvement in cucumber. **Haryana J. Hort. Sci.**, **19** (3-4): 349-352.
- Ahmed, N., Z.A. Hakeem, A.K. Singh and Baseerat Afroza. 2005. Correlation and path coefficient analysis in bottle gourd. **Haryana J. Hort. Sci.**, **34** (1-2): 104-106.
- Allard, R.W. 1960. **Principles of Plant Breeding**. John Wiley and Sons. Inc., U.S.A. 485 P.
- Ananthan, M., G. Balakrisnamoorthy and S. Natarajan. 2005. Genetic variability in ridge gourd (*Luffa acutangula* (Roxb.) L.). **South Indian Hort.**, **53** (1-6): 326-328.
- Anonymous. 2002. Annual report, Asian Vegetable Research and Development Center pp:122.
- Ahmed, N., Z. Hakeem, Baseerat Afroza, Raj Narayan and Syed Faheema. 2005. Variability studies in bottlegourd. **Haryana J. hort. Sci.**, **34** (3-4): 336-337.
- Ashish kumar, Sanjay kumar and Akhilesh Kumar Pal. 2008. Genetic variability and characters association for fruit yield and yield traits in cucumber. **Indian J. Hort.**, **65** (4): 423-428.
- Bairagi, S.K., Hari Har Ram, D.K. Singh and S.K. Maurya. 2005. Exploitation of hybrid vigour for yield and attributing traits in cucumber. **Indian J. Hort.**, **62** (1): 41-45.
- Bharathi, L.K. 2005. Correlation and Path analysis in spine gourd (*Momordica dioica* Roxb.) **Orissa J. Hort.**, **33** (2): 105-108.
- Borthakur, U. and A. Shadeque. 1994. Character association in pumpkin (*Cucurbita moschata* Poir). **South Indian Hort.**, **42** (1): 15-17.
- Burton, G.W. 1952. Quantitative inheritance in grasses. **Sixth international grassland cong.**, **1**: 277-283.

- Chaudhari, S.M., P.N.Kale and U.T.Desai. 1991. Variability studies and scope of improvement in fruit yield in bitter gourd. **Journal of Maharashtra Agrl. Universities.**, **16** (1): 15-17.
- Choudhary,B.R., R.S.Dhaka and M.S.Fegeria.2003.Association studies in muskmelon correlation and path coefficient analysis in musk melon.(*Cucumis melo* L.) **Harayana J.Hort.Sci.**, **32** (1&2):98-101.
- Chopra,S.L. and J.S.Kanwar. 1976. **Analytical agricultural chemistry**. Kalyani Publishers, New Delhi.
- Dhatt,A.S.,and Hardevinder Singh .2008.Genetic variability, correlation and path co-efficient analysis in pumpkin. **Crop Improvement.**, **35**(1):91-94.
- Dahiya,M.S., M.L.Pandita and R.N.Vashistha. 1990. Studies on variability and heritability in summer squash. **Research and Development Reporter.**, **7**(1-2): 102-105.
- Devi Singh,JohnP.Anuraj and V.B.Rajwade.2006.Genetic variability, heritability and genetic advance in bitter gourd (*Momordica charantia.*) **The Allahabad Farmer. LX.No.2.**
- Doijode, S.D. 1994. Correlation studies in pumpkin. **Haryana J. Hort. Sci.**, **11** (1-2): 42-45.
- Dora, D.K., T.K. Behera, G.C. Acharya, P.Mohapatra and B.Mishra. 2002. Genetic variability and character association in pointed gourd. **Indian J. Hort.**, **60** (2): 163-166.
- El.Shawaf, I.I.S.and L.R.Bager.1981.Combining ability and genetic divergence of G×HF, hybrids for parthenocarpic yield in gynoecious pickling cucumber for once over mechanical harvest. **J.Amer.Soc.Hort.Sci.**, **106**:365-370.
- Falconer, D.S. 1967. **Introduction to quantitative genetics**. Oliver and Boyd Ltd., London, W.I., 365P.
- Frankel, O.H. 1947. The theory of plant breeding for yield. **Heredity.**, **1**: 109-120.
- Frey, K.J. 1967. Mass selection for seed within oat population. **Euphytica.**,**16**: 341-349.

- Gardener, C.O. 1961. An evaluation of effects of mass selection and seed irradiation with thermal neutrons on yield of corn. **Crop Science**, **1**: 241-245.
- Geetashri Parhi, H.N. Mishra and R.S. Mishra. 1995. Correlation and path coefficient studies in bitter gourd (*Momordica charantia* L.). **Indian. J. Hort.**, **55**(1): 41-45.
- Gill, B.S. and J.C. Kumar. 1986. Variability in genetic stock and heritable components in water melon. **J. Res. Punjab Agric. Univ.**, **23** (4): 583-588.
- Gilbert, N.E. 1958. Diallel cross in plant breeding. **Heredity**, **12**:477-492.
- Goulden, C.H. 1952. **Methods of statistical Analysis**. John Wiley and Sons Inc., New York, 47p.
- Gurkaran Singh and Tarsem Lal. 2005. Genetic variability, heritability and genetic advance for yield and its contributing traits in musk melon. (*Cucumis melo* L.) **J. Res. Punjab Agri. Univ.**, **42**(2):168-174
- Hanson, W.D. 1961. **Heritability in statistical genetics and plant breeding**. Nat. Acad. Sci. National Res. Council Washington: 125-140.
- \*Johnson, H.W., H.F. Robinson and R.E. Comstock. 1955a. Estimates of genetic and environmental variability in soybeans. **Agron.J.**, **47**: 314-318.
- \*Johnson, H.W., H.F. Robinson and R.E. Comstock. 1955b. Estimates of phenotypic and genotypic correlation in soybean and their implications in selection. **Agron.J.**, **47**:477-482.
- Joseph, S. 1999. Evaluation of diploids and polyploids of ivy gourd (*Coccinia grandis* (L.) Voight) .**M.Sc. (Agri.) Thesis** .Kerala Agricultural University, Thrissur.
- Kabilar, K. 1999. Studies on diallel analysis in bitter gourd (*Momordica charantia* L.) **M.Sc. (Hort.) Thesis**, T.N.A.U, Coimbatore.
- Kadam, P.Y., U.T. Desai and P.N. Kale. 1992. Correlation studies in ridge gourd. **Maharashtra J. Hort.**, **6** (1):45-47.
- Karuppaiah, P., R. Kavitha and P. Senthilkumar. 2002. Studies on variability, heritability and genetic advance in ridge gourd. **Indian J. Hort.**, **59** (3): 307-312.

- Krishna Prasad, V.S.R., M.Pitchaimuthu and O.P.Dutta. 2002. Adaptive responses and diversity pattern in water melon (*Citrullus lanatus* (Thunb.) Mansf.). **Indian J. Hort.**, **59** (3):298-306.
- Krishna Prasad, V.S.R., M.Pitchaimuthu and O.P.Dutta. 2004. Variation, diversity pattern and choice of parental selection in musk melon (*Cucumis melo* L.) improvement. **Indian J. of Hort.**, **61**(4):319-322.
- Krishna Reddy, A.N., A.D.Munshi, T.K.Behera, and A.K.Sureja.2007. Correlation and path analyses for yield and bio chemical characters in snap melon (*Cucumis melo* var.*momordica*). **SABRO Journal of Breeding and Genetics.**, **39** (1):62-72.
- Kumaresan, G.R. 2000. Diallel analysis in snake gourd (*Trichosanthes anguina* L.).**M.Sc. (Hort.) Thesis**, T.N.A.U, Madurai.
- Lalta Prasad, N.C., Gautam and S.P. Singh. 1988. Studies on genetic variability and character association in water melon.**Veg. Sci.**, **15** (1): 86-94.
- Lawande, K.E. and A.V. Patil. 1989. Correlation studies in bitter gourd. **J. Maharastra Agri. Univ.**, **14** (1): 77-79.
- Lerner, I.M. 1958. **The genetic basis of selection**. John Wiley and Sons, New York: 57-65.
- Lush, J.L. 1940. Intra-sire correlation and regression of off spring on Ranus as a method of estimating heritability of characters. **Proc. Amer. Soc. Animal Production.**, **33**: 293-301.
- Mahendra Prasad., Moti Singh and B.P.Srivastava. 1993. Genetic variability and correlation studies in bottle gourd. **Haryana J. Hort. Sci.**, **22**(3): 222-227.
- Mathura Rai and A.K.Pandey .2007.THE HINDU. **Survey of Ind.Agri.** pp112-119.
- Mariappan, S. 1989. Variability studies in cucumber (*Cucumis sativus* L.). **M.Sc. (Hort.) Thesis**, Dept. of Horticulture, AC & RI, Madurai.
- Maurya, S.K., Hari Har Ram, and J.P.Singh. 2003. Hybrid breeding in bottle gourd. **Prog. Hort.**, **35** (1):46-50.
- Mohanthy, B.K. 2003. Studies on variability and selection parameters in pumpkin. **South Indian Hort.**, **48** (1-6):111-113.

- Moll, R.M and C.W. Stuber. 1974. Quantitative Genetics. **Adv. Agron.**, 26: 277-286.
- Mukunda Lakshmi, L., K. Haribabu and G.L.K. Reddy. 2002. Character association and path coefficient studies in pumpkin (*Cucurbita moschata* Duch. ex. Poir). **The Andhra Agric. J.**, **49** (1& 2): 80-85.
- Munshi, K.S. and P.S. Sirohi. 1994. Combining ability estimates in bitter gourd. (*Momordica charantia* L). **Veg. Sci.**, **21** (2): 132-136.
- Murali, B., K. Haribabu and V.Parthasarathy Reddy. 1986. Correlation studies in bottle gourd (*Lagenaria siceraria* (Monia.) Standl). **South Indian Hort.**, **34** (5): 338-340.
- Murlee Yadav, Rashmi Chaudhary and Amar Chanda. 2004. Correlation studies of different varieties of bitter gourd (*Momordica charantia* L). **The Allahabad farmer. LVIII No.1**: 37-41.
- Murlee Yadav, Amar Chanda, Rashmi Chaudhary and D.B.Singh. 2004. Heritability and genetic advance as percent of mean in bitter gourd (*Momordica charantia* L.). **The Allahabad Farmer, Vol LVIII.No.1**: 49-54.
- Muthulakshmi, K. and C.M.Pappiah. 1996. Mean performance and heritability in F<sub>2</sub> and F<sub>3</sub> generations of cucumber. **South Indian Hort.**, **44** (3&4): 99-100.
- Nagaprasuna, R. and M.Rama Rao. 1989. Correlation studies and path co-efficient analysis in the segregating population of cucumber (*Cucumis* sp.). **South Indian Hort.**, **37**(4): 212-214.
- Nayar, N.M. and T.A. More. 1998. Cucurbits. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
- Nisha. 1999. Diallel analysis in Pumpkin (*Cucurbita moschata* Duch. ex. Poir). **M.Sc.(Hort.) Thesis**, Department of Olericulture, T.N.A.U, Coimbatore.
- Nirmal De, S.Pandey, K.P.Singh. and M.Rai. 2003. Integrated development of gourds and melons. **Technical Bulletin 13**, Indian Institute of Vegetable Research, Varanasi. Pp:18.
- Panse, V.G. and P.V. Sukhatme. 1961. **Statistical Methods for Agricultural Workers**, I.C.A.R., New Delhi, 381p.

- Patil, R.M. and A.A.Patil. 1985. Studies on relative performance of different genotypes of cucumber (*Cucumis sativus* L). **South Indian Hort.**, **33**(4): 225-229.
- Puddan,M. 2000. Genetic variability studies in F<sub>2</sub> and F<sub>3</sub> generation of bitter gourd **M.Sc.(Hort.) Thesis**, Department of Olericulture, AC and RI, T.N.A.U, Madurai.
- Punitha.A.2000. Genetic variability studies in cucumber (*Cucumis sativus* L.). **M.Sc. (Hort.) Thesis**, Department of Olericulture, AC and RI, T.N.A.U, Madurai.
- Rajendran, P.C. 1989. Crop improvement in water melon (*Citrullus lanatus* Thunbmani f.) **Ph.D. (Hort.) Thesis**, Department of Olericulture, T.N.A.U, Coimbatore.
- Rajput,J.E., S.L. Patil,Y.R. Parulekar and V.H. Patil. 1996. Konkan Tara. A new bitter gourd variety for export. **Haryana J. Hort. Sci.**, **24** (3-4): 274-281.
- Rao, E.S., A.D. Munshi and V.K. Verma. 2004. Genetic association and interrelationship of yield and its components of cucumber (*Cucumis sativus* L.). **Indian J. Hort.**, **61** (4): 315-318.
- Ram,D.,H.K.Singh, Ajay Verma,Sudhakar Pandey and M.Rai.2006.Cause and effect analysis of yield in off-season bitter gourd (*Momordica charantia* L.). **Prog. Hort.**, **38** (2):178-183.
- Rashogi, K.B. and Aryadeep. 1990. Variability studies in cucumber (*Cucumis sativus* L.).**Veg. Sci.**, **17** (2): 224-226.
- Ratna Prabha,J., T.Padmalatha,C.Ravi Sankar and V.Srinivasa Rao. 2007. Variability, heritability and genetic advance in ridge gourd (*Luffa acutangula* (Roxb) L.). **The Andra Agric.J.**, **54** (1&2) :104-106.
- Rakhi,R and L.Rajamony.2005.Variability,heritability and genetic advance in land races of culinary melon (*Cucumis melo* L.). **Journal of Tropical Agriculture.**, **43** (1-2):79-82.
- Richard Kennedy, R., R. Arumugam, G.Kandasamy and S.Suresh. 1995. Heterosis studies in bitter gourd (*Momordica charantia* L). **Madras Agric. J.**, **82** (2): 21-123.

- Ritu Pandey, D.K. Singh and Megha Upadhyay. 2006. Study of correlation and path coefficient under different seasons in sponge gourd (*Luffa cylindrica* Roem.). **Prog. Hort.**, **38** (2): 224-229.
- \*Robinson, H.F., R.E. Comstock and P.H. Harvey. 1949. Estimates of heritability and the degree of dominance in corn. **Agron. J.**, **41**: 353-359.
- Rukam, S. Tomar, G.U. Kulkarni, D.K. Kakade, A.D. Patel and R.R. Acharya. 2008. Genetic variability, correlation and path analysis in musk melon (*Cucumis melo* L.). **Asian J. Hort.**, **3** (1): 158-161.
- Sarnaik, D.A. 1999. Final report on collection and evaluation of germplasm and standardization of agro-techniques of ivy gourd (*Coccinia grandis* L.). Department of Horticulture, Indira Gandhi Agricultural University, Raipur. pp 37-40.
- Sahni, G.P., R.K. Singh and B.C. Saha. 1985. Correlation and path analysis in ridge gourd (*Luffa acutangula* Roxb.). **Prog. Hort.**, **17** (3): 193-196.
- Saikia, J., A. Shadeque and G.C. Bora. 1995. Genetic studies in cucumber, correlation and path coefficient analysis. **Haryana J. Hort. Sci.**, **24** (2): 126-130.
- Samadia, D.K. 2007. Studies on genetic variability and scope of improvement in round melon under hot arid conditions. **Indian J. Hort.**, **64** (1): 58-62
- Sanju Susan Mathew and Abdul Khader. 1999. Genetic studies on variability, genetic advance and characters association in ribbed gourd. **South Indian.**, **32** (2): 97-100.
- Sathyanarayana Reddy, K.S. and M. Rama Rao. 1984. Studies on heritability, genetic advance and character association in ribbed gourd. **South Indian Hort.**, **32** (2): 97-100.
- Saroj Rolania, M.S. Fageria, R.S. Dhaka and R.G. Jat 2003. Correlation and path coefficient analysis in water melon (*Citrullus lanatus* (Thunb.) Mansf.). **Haryana J. Hort. Sci.**, **32** (1&2): 113-116.
- Sarnaik, D.A., S.K. Verma and G.L. Sharma. 1999. Characters association in ivy gourd (*Coccinia grandis* L.). **Ann. agric. Rec.**, **2** (4): 436-438.

- Sendurkumaran, S., S. Natarajan and S. Thamburaj. 1998. Genetic variability in pumpkin (*Cucurbita moschata* Duch expoir.). **South Indian Hort.**, **45** (1 & 2): 10-12.
- Shanmugasundaram (2006).Evaluation of water melon hybrids for yield and quality. Department of Horticulture. PANJANCO. Karaikal.
- Shanthi Priya, S., N.Chezhiyan and A. Ramar. 2004. Variability studies in watermelon for morphological traits (*Citrullus lanatus* (Thumb) Mastum and Nakai). **South Indian Hort.**, **52** (1-6): 104 -108.
- Sharma, N.K. and B.S. Dhankhar.1989. Performance of bottle gourd genotypes. **Haryana Agric. Univ. J. Res.**, **19** (3): 246-248.
- Sheo Pujan Singh, N.K.Singh and I.B. Maurya. 1996. Genetic variability and correlation studies in bottle gourd (*Lagenaria siceraria* (Mollina) Stadhl). **PKV Res J.**, **Vol 20** (1): 88-89.
- Singh, N.K. and R.K. Singh. 1988. Correlation and path coefficient analysis in water melon (*Citrullus lanatus* (Thunb.) Mansf.). **Veg. Sci.**, **15** (1): 95-100.
- Singh, R.K., S.K.Verma, R.R.Arya and K.C.Muneem. 2002. Genetic variability in chow-chow (*Sechium edule* L.) **Prog. Hort.**, **34** (1): 92-24.
- Singh, S.P. and H.N.Singh. 1982. Studies on genetic parameters in okra (*Abelmoschus esculentus* (L) Moench). **The Lal Baugh.**, **27** (2): 53-65.
- Singh,S.P.1990. **Production technology of vegetable crops**. A.R.C.C. Ludhiana. Pp:279-281.
- Siby Varghese, D.Chanramony and G.Seeja.2005.Correlation and path co-efficient analysis in ivy gourd. **South Indian Hort.**, **53** (1-6):120-125.
- Sivasubramanian,S. and P.Madhava Menon .1973.Genotypic and phenotypic variability in rice. **Madras Agric .J.**,**Vol 60**.
- Snedecor, G.W. and Cochran. 1961. **Statistical Methods**. Iowa State University Press Amer., Iowa, U.S.A
- Suchitra,V and K.Haribabu.2007.Genetic divergence and variability studies in bottle gourd (*Lagenaria siceraria* (Mol) Standl). **The Allahabad Farmer.**, **Vol XIII** (1): 66-72.

- Sumathi,L 2001. Genetic variability studies in F<sub>2</sub> and F<sub>3</sub> generation of bitter gourd (*Momordica charantia* L.). **M.Sc.(Hort.) Thesis**, HC and RI, T.N.A.U, Periyakulam.
- Suribabu, B.E., Nagabhushanam Reddy and M. Rama Rao. 1986. Inheritance of certain quantitative and qualitative characters in bitter gourd (*Momordica charantia* L.). **South Indian Hort.**, **34**(6): 380-386.
- Swamy,K.R.M., O.P.Dutta., P.R.Ramachandran and S.D.Wahi. 1985. Variability studies in musk melon (*Cucumis melo* L.). **Madras agric. J.**, **72** (1): 1-5.
- Tarsem Lal and Sanjay Singh.1997. Genetic variability and selection indices in melon (*Cucumis melo* L.). **Veg. Sci.**, **24** (2):111-117.
- Thakur, J.C., A.S. Khatt ra and K.S. Brar.1996. Correlation studies between economic traits; fruit fly infestation and yield in bitter gourd. **Punjab Veg. Grower.**, **31**: 37-40.
- Torkadi,S.S.,A.M.Musmade and K.K.Mangave. 2007. Genetic variability studies in musk melon (*Cucumis melo* L.).**J. Soils and Crops.**, **17** (2):308-311.
- Varghese, P. 1991. Heterosis in snake gourd (*Trichosanthes anguina* L.). **M.Sc.(Hort.) Thesis**. Kerala Agricultural University, Vellanikkara, Kerala.
- Varghese,P. and S.Rajan.1993.Heterosis in snake gourd. (*Trichosanthes anguina* L.). **M.Sc.(Hort.) Thesis**. Kerala Agricultural University. Vellanikara.
- Varalakshmi,B.,P.Venkat Rao and Y.Narayana Reddy.1995.Genetic variability and heritability in ridge gourd(*Luffa acutangula* L.).**Indian J. Agri. Sci.**, **65** (8):608-610.
- Vashistha, R.N., P.S. Partap and M.L. Pandita. 1987. Gene effects and heritability studies for T.S.S and rind thickness in water melon. **Veg. Sci.**, **14** (2): 147-151.
- Vijay,O.P. 1987. Genetic variability, correlation and path analysis in musk melon (*Cucumis melo* L.). **Indian J. of Hort.**, **44**: 233-238.
- Yadav, R.K. and Hari Har Ram. 2002. Correlation and path coefficient analysis in musk melon. **Prog. Hort.**, **34**(1): 72-76.

\* Originals not seen.

**Table.2. Mean, range, coefficient of variation (CV) and standard error (SE) for vine length (m) in ivy gourd**

S.No	Tretments	Mean $\pm$ SE	Range	CV
1	CG1	4.50 $\pm$ 0.44	3.5-5.5	22.61
2	CG2	3.91 $\pm$ 0.20	3.5-4.3	10.46
3	CG3	4.30 $\pm$ 0.34	3.5-5.0	18.69
4	CG4	4.85 $\pm$ 0.61	3.2-5.9	28.93
5	CG5	3.54 $\pm$ 0.39	2.8-4.6	22.69
6	CG6	3.26 $\pm$ 0.28	2.7-3.9	17.85
7	CG7	2.90 $\pm$ 0.39	2.2-3.8	26.97
<b>Mean</b>		<b>3.89 <math>\pm</math> 0.38</b>	<b>3.05-4.71</b>	<b>21.17</b>

**Table.3. Mean, range, coefficient of variation (CV) and standard error (SE) for days to first female flower appearance in ivy gourd**

S.No	Tretments	Mean $\pm$ SE	Range	CV
1	CG1	46.75 $\pm$ 1.75	43-51	6.02
2	CG2	52.00 $\pm$ 1.58	49-56	6.01
3	CG3	51.50 $\pm$ 2.90	43-56	11.01
4	CG4	47.00 $\pm$ 2.94	41-53	12.09
5	CG5	48.50 $\pm$ 2.84	42-55	10.45
6	CG6	54.25 $\pm$ 2.46	48-60	9.09
7	CG7	53.50 $\pm$ 2.06	48-58	7.20
<b>Mean</b>		<b>50.67 <math>\pm</math> 2.36</b>	<b>44.85-55.57</b>	<b>8.83</b>

**Table.4. Mean, range, coefficient of variation (CV) and standard error (SE) for node number at which first female flower appear in ivy gourd**

<b>S.No</b>	<b>Tretments</b>	<b>Mean ± SE</b>	<b>Range</b>	<b>CV</b>
1	CG1	25.75 ± 1.25	23-29	9.70
2	CG2	27.00 ± 2.35	23-32	17.37
3	CG3	22.25 ± 1.11	20-25	9.93
4	CG4	26.50 ± 1.32	24-30	9.96
5	CG5	28.75 ± 0.48	28-30	3.30
6	CG6	26.75 ± 0.85	25-29	6.35
7	CG7	27.00 ± 1.08	24-29	8.42
<b>Mean</b>		<b>26.28 ± 1.21</b>	<b>23.85-29.14</b>	<b>9.29</b>

**Table.5. Mean, range, coefficient of variation (CV) and standard error (SE) for inter nodal length (cm) in ivy gourd**

<b>S.No</b>	<b>Tretments</b>	<b>Mean ± SE</b>	<b>Range</b>	<b>CV</b>
1	CG1	8.1 ± 0.23	7.5-8.6	6.79
2	CG2	9.0 ± 0.21	8.5-9.4	4.92
3	CG3	7.0 ± 0.18	6.5-7.3	5.91
4	CG4	8.5 ± 0.34	7.5-9.0	8.68
5	CG5	9.2 ± 0.30	8.7-10	6.78
6	CG6	7.8 ± 0.65	6.8-9.7	16.31
7	CG7	7.1 ± 0.39	6.4-8.0	10.96
<b>Mean</b>		<b>8.1 ± 0.34</b>	<b>7.41-8.85</b>	<b>8.62</b>

**Table.6. Mean, range, coefficient of variation (CV) and standard error (SE) for days to first harvest in ivy gourd**

S.No	Tretments	Mean $\pm$ SE	Range	CV
1	CG1	54.00 $\pm$ 0.91	52-56	4.45
2	CG2	59.25 $\pm$ 2.53	53-65	8.85
3	CG3	56.75 $\pm$ 1.75	53-61	7.01
4	CG4	52.75 $\pm$ 0.85	51-55	4.93
5	CG5	56.00 $\pm$ 2.41	49-60	9.89
6	CG6	61.50 $\pm$ 3.10	53-67	10.56
7	CG7	58.50 $\pm$ 3.71	48-65	12.71
<b>Mean</b>		<b>56.96 <math>\pm</math> 2.18</b>	<b>51.28-69.28</b>	<b>8.34</b>

**Table.7. Mean, range, coefficient of variation (CV) and standard error (SE) for fruit weight (g) in ivy gourd**

S.No	Tretments	Mean $\pm$ SE	Range	CV
1	CG1	18.77 $\pm$ 0.61	17.14-20.00	6.49
2	CG2	13.71 $\pm$ 0.99	11.81-16.31	17.52
3	CG3	13.41 $\pm$ 1.67	10.08-17.18	24.9
4	CG4	19.45 $\pm$ 0.43	18.50-20.5	7.59
5	CG5	19.96 $\pm$ 0.42	19.20-21.13	6.87
6	CG6	13.18 $\pm$ 1.59	10.08 -17.58	23.86
7	CG7	9.43 $\pm$ 0.43	8.75-10.62	9.68
<b>Mean</b>		<b>15.41 <math>\pm</math> 0.88</b>	<b>13.69-17.61</b>	<b>13.84</b>

**Table.8. Mean, range, coefficient of variation (CV) and standard error (SE) for fruit length (cm) in ivy gourd**

<b>S.No</b>	<b>Tretments</b>	<b>Mean ± SE</b>	<b>Range</b>	<b>CV</b>
1	CG1	6.25 ± 0.21	5.8-6.8	7.38
2	CG2	5.52 ± 0.27	4.9-6.1	9.79
3	CG3	6.02 ± 0.38	5.2-6.8	12.83
4	CG4	8.05 ± 0.31	7.5-8.9	8.33
5	CG5	7.42 ± 0.23	5.9-8.0	7.75
6	CG6	4.62 ± 0.21	4.1-5.0	8.91
7	CG7	4.60 ± 0.20	4.2-5.0	8.61
<b>Mean</b>		<b>6.06 ± 0.26</b>	<b>5.37-6.51</b>	<b>9.08</b>

**Table.9. Mean, range, coefficient of variation (CV) and standard error (SE) for fruit girth (cm) in ivy gourd**

<b>S.No</b>	<b>Tretments</b>	<b>Mean ± SE</b>	<b>Range</b>	<b>CV</b>
1	CG1	7.82 ± 0.22	7.4-8.3	6.34
2	CG2	5.97 ± 0.17	5.6-6.3	5.71
3	CG3	6.92 ± 0.18	6.5-7.3	5.87
4	CG4	7.30 ± 0.22	6.8-7.8	7.02
5	CG5	6.65 ± 0.16	6.3-7.0	5.45
6	CG6	5.80 ± 0.20	5.3-6.2	6.85
7	CG7	5.75 ± 0.26	5.0-6.2	5.83
<b>Mean</b>		<b>6.60 ± 0.20</b>	<b>6.21-7.01</b>	<b>6.15</b>

**Table.10. Mean, range, coefficient of variation (CV) and standard error (SE) for fruit number per vine in ivy gourd**

S.No	Tretments	Mean $\pm$ SE	Range	CV
1	CG1	1124.00 $\pm$ 18.58	1099-1178	4.89
2	CG2	941.25 $\pm$ 24.65	899-998	8.38
3	CG3	1171.00 $\pm$ 41.20	1055-1248	7.76
4	CG4	991.75 $\pm$ 58.08	876-1145	11.89
5	CG5	763.50 $\pm$ 52.01	677-900	14.83
6	CG6	833.00 $\pm$ 31.77	763-903	7.62
7	CG7	1093.25 $\pm$ 69.22	990-1287	12.66
<b>Mean</b>		<b>988.25 <math>\pm</math> 42.21</b>	<b>908.42-1094.14</b>	<b>9.71</b>

**Table.11. Mean, range, coefficient of variation (CV) and standard error (SE) for number of seeds per fruit in ivy gourd**

S.No	Tretments	Mean $\pm$ SE	Range	CV
1	CG1	176 $\pm$ 14.46	152-218	16.43
2	CG2	136 $\pm$ 13.60	116-176	20.35
3	CG3	149 $\pm$ 10.91	126-176	14.64
4	CG4	192 $\pm$ 6.23	178-203	8.81
5	CG5	162 $\pm$ 17.37	111-189	21.44
6	CG6	123 $\pm$ 8.08	109-145	13.36
7	CG7	111 $\pm$ 10.79	89-131	19.45
<b>Mean</b>		<b>149.8 <math>\pm</math> 11.63</b>	<b>125.85-176.85</b>	<b>16.35</b>

**Table.12. Mean, range, coefficient of variation (CV) and standard error (SE) for total soluble solids (° Brix) in ivy gourd**

<b>S.No</b>	<b>Tretments</b>	<b>Mean ± SE</b>	<b>Range</b>	<b>CV</b>
1	CG1	2.85 ± 0.31	2.3-3.7	18.23
2	CG2	2.3 ± 0.27	1.6-2.9	23.00
3	CG3	4.5 ± 0.15	4.1-4.8	6.44
4	CG4	3.2 ± 0.32	2.3-3.8	15.02
5	CG5	3.3 ± 0.18	2.8-3.6	10.90
6	CG6	2.85 ± 0.26	2.4-3.4	15.75
7	CG7	2.92 ± 0.17	2.6-3.4	10.31
<b>Mean</b>		<b>3.13 ± 0.24</b>	<b>2.58-3.65</b>	<b>14.23</b>

**Table.13. Mean, range, coefficient of variation (CV) and standard error (SE) for total carbohydrate (g /100 g) content in ivy gourd**

<b>S.No</b>	<b>Tretments</b>	<b>Mean ± SE</b>	<b>Range</b>	<b>CV</b>
1	CG1	3.30 ± 0.45	2.09-4.20	27.21
2	CG2	3.87 ± 0.38	3.12-4.63	22.05
3	CG3	3.98 ± 0.26	3.49-4.56	13.76
4	CG4	4.23 ± 0.25	3.79-4.81	11.56
5	CG5	5.10 ± 0.31	4.52-5.78	14.90
6	CG6	2.67 ± 1.18	2.29-3.08	16.85
7	CG7	3.25 ± 0.07	3.16-3.45	10.45
<b>Mean</b>		<b>3.77 ± 0.41</b>	<b>3.20-4.35</b>	<b>16.68</b>

**Table.14. Mean, range, coefficient of variation (CV) and standard error (SE) for protein content (g/100 g) in ivy gourd**

S.No	Tretments	Mean $\pm$ SE	Range	CV
1	CG1	4.39 $\pm$ 0.45	3.21-5.29	20.55
2	CG2	3.24 $\pm$ 0.18	2.82-3.69	15.89
3	CG3	4.37 $\pm$ 0.19	3.88-4.70	10.98
4	CG4	5.10 $\pm$ 0.24	4.55-5.63	8.82
5	CG5	3.79 $\pm$ 0.29	2.98-4.36	15.49
6	CG6	3.59 $\pm$ 0.24	2.91-3.99	13.63
7	CG7	4.32 $\pm$ 0.20	3.89-4.81	9.59
<b>Mean</b>		<b>4.11 <math>\pm</math> 0.25</b>	<b>3.46-4.63</b>	<b>13.56</b>

**Table.15. Mean, range, coefficient of variation (CV) and standard error (SE) for crude fibre (%) content in ivy gourd**

S.No	Tretments	Mean $\pm$ SE	Range	CV
1	CG1	4.17 $\pm$ 0.18	3.9-4.69	7.01
2	CG2	2.92 $\pm$ 0.18	2.48-3.37	12.11
3	CG3	2.50 $\pm$ 0.20	1.98-2.91	16.20
4	CG4	1.48 $\pm$ 0.09	1.27-1.65	11.81
5	CG5	2.48 $\pm$ 0.09	2.29-2.73	7.55
6	CG6	3.40 $\pm$ 0.21	2.86-3.89	12.09
7	CG7	1.83 $\pm$ 0.19	1.29-2.12	20.13
<b>Mean</b>		<b>2.68 <math>\pm</math> 0.16</b>	<b>2.47-3.05</b>	<b>12.41</b>

**Table.16. Mean, range, coefficient of variation (CV) and standard error (SE) for yield per vine (kg) in ivy gourd**

S.No	Treatments	Mean $\pm$ SE	Range	CV
1	CG1	21.29 $\pm$ 1.01	18.68-23.5	7.89
2	CG2	13.00 $\pm$ 0.79	11.25-15	10.13
3	CG3	16.40 $\pm$ 0.76	14.65-18.2	8.08
4	CG4	19.14 $\pm$ 1.04	16.85-21.85	9.07
5	CG5	14.27 $\pm$ 0.72	12.75-15.9	12.03
6	CG6	11.65 $\pm$ 0.82	10.13-13.43	13.00
7	CG7	10.63 $\pm$ 1.16	7.46-12.85	16.9
<b>Mean</b>		<b>15.19 <math>\pm</math> 0.90</b>	<b>13.10-17.24</b>	<b>11.01</b>

**Table 16a. Mean value of fruit number and seed number per kg of fruit**

Characters	Genotypes		
	CG 4	CG 1	CG 3
Single fruit weight (g)	19.45	18.77	13.41
Fruit number / kg of fruit	51.81	52.79	71.40
Seed number / kg fruit	9947.52	9291.04	10638.6

**Table.17. Mean, range, coefficient of variation (CV) and standard error (SE)  
for fifteen traits in ivy gourd**

<b>S.No</b>	<b>Characters</b>	<b>Mean <math>\pm</math> SE</b>	<b>Range</b>	<b>CV</b>
1	Vine length (m)	3.89 $\pm$ 0.38	2.9-4.85	21.17
2	Days to first female flower appearance	50.67 $\pm$ 2.36	46.75 -54.25	8.83
3	Node number at which first female flower appear	26.28 $\pm$ 1.21	22.25-28.75	9.29
4	Inter nodal length (cm)	8.10 $\pm$ 0.34	7-9.20	8.62
5	Days to first harvest	56.96 $\pm$ 2.18	54-61.50	8.34
6	Fruit weight (g)	15.41 $\pm$ 0.88	9.43-19.96	13.84
7	Fruit length (cm)	6.06 $\pm$ 0.26	4.6-8.05	9.08
8	Fruit girth (cm)	6.60 $\pm$ 0.20	5.75-7.82	6.15
9	Fruit number per vine	988.25 $\pm$ 42.21	833-1124	9.71
10	Number of seeds per fruit	149.8 $\pm$ 11.63	111-192	16.35
11	Total soluble solids ( $^{\circ}$ Brix)	3.13 $\pm$ 0.24	2.3-4.50	14.23
12	Total carbohydrate content (g /100)	3.77 $\pm$ 0.41	2.67-5.10	16.68
13	Protein content (g /100 g)	4.11 $\pm$ 0.25	3.24-5.10	13.56
14	Crude fibre (%)	2.68 $\pm$ 0.16	1.48-4.17	12.41
15	Yield per vine (kg)	15.19 $\pm$ 0.90	10.63-21.29	11.01

**Table.18. Phenotypic Variance (PV), genotypic variance (GV) and Environmental variance (EV) for fifteen traits in ivy gourd**

<b>S.No</b>	<b>Characters</b>	<b>PV</b>	<b>GV</b>	<b>EV</b>
1	Vine length (m)	1.00	0.32	0.67
2	Days to first female flower appearance	24.35	4.46	19.89
3	Node number at which first female flower appear	8.46	2.49	5.96
4	Inter nodal length (cm)	1.11	0.62	0.48
5	Days to first harvest	26.23	3.62	22.61
6	Fruit weight (g)	19.40	14.84	4.55
7	Fruit length (cm)	1.63	1.34	0.29
8	Fruit girth (cm)	0.76	0.60	0.16
9	Fruit number per vine	30188.14	20978.84	9209.30
10	Number of seeds per fruit	1289.03	688.29	600.74
11	Total soluble solids (° Brix)	0.61	0.41	0.19
12	Total carbohydrate content (g /100 g)	0.92	0.52	0.39
13	Protein content (g /100 g)	0.62	0.30	0.32
14	Crude fibre (%)	0.92	0.80	0.11
15	Yield per vine (kg)	17.63	14.83	2.97

**Table.19. Phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV) and environmental coefficient of variation (ECV) for fifteen traits in ivy gourd**

S.No	Characters	PCV (%)	GCV (%)	ECV (%)
1	Vine length (m)	25.82	14.78	21.17
2	Days to first female flower appearance	9.77	4.18	8.83
3	Node number at which first female flower appear	11.06	6.01	9.29
4	Inter nodal length (cm)	13.02	9.75	8.62
5	Days to first harvest	8.99	3.34	8.34
6	Fruit weight (g)	28.56	24.98	13.84
7	Fruit length (cm)	21.54	19.53	9.08
8	Fruit girth (cm)	13.25	11.73	6.15
9	Fruit number per vine	17.58	14.65	9.71
10	Number of seeds per fruit	23.95	17.50	16.35
11	Total soluble solids (° Brix)	25.04	20.60	14.23
12	Total carbohydrate content (g /100 g)	25.42	19.18	16.68
13	Protein content (g /100 g)	19.17	13.37	13.56
14	Crude fibre (%)	35.71	33.48	12.41
15	Yield per vine (kg)	27.62	25.34	11.00

**Table.20.Heritability (Broad Sense), genetic advance and genetic advance as per cent of mean for fifteen traits in ivy gourd**

<b>S.No</b>	<b>Characters</b>	<b>Heritability (%)</b>	<b>GA</b>	<b>GA (%) of mean</b>
1	Vine length (m)	32	0.67	17.43
2	Days to first female flower appearance	18	1.85	3.68
3	Node number at which first female flower appear	29	1.76	6.72
4	Inter nodal length (cm)	56	1.21	15.06
5	Days to first harvest	13	1.45	2.56
6	Fruit weight (g)	76	6.94	45.02
7	Fruit length (cm)	82	2.16	36.49
8	Fruit girth (cm)	78	1.41	21.41
9	Fruit number per vine	69	248.64	25.16
10	Number of seeds per fruit	53	39.48	26.35
11	Total soluble solids ( <sup>o</sup> Brix)	67	1.09	34.93
12	Total carbohydrate content (g /100 g)	56	1.12	29.80
13	Protein content (g /100 g)	48	0.78	19.22
14	Crude fibre (%)	87	1.73	64.68
15	Yield per vine (kg)	84	7.27	47.88

**Table.1. Analysis of variance for fifteen traits in ivy gourd**

S.No	Characters	Mean sum of square	
		Genotype	Error
1	Vine length (m)	1.98*	0.67
2	Days to first female flower appearance	43.64NS	19.58
3	Node number at which first female flower appear	15.95 *	5.97
4	Inter nodal length (cm)	2.98**	0.49
5	Days to first harvest	37.11NS	22.62
6	Fruit weight (g)	63.94**	4.56
7	Fruit length (cm)	5.65**	0.29
8	Fruit girth (cm)	2.56 **	0.16
9	Fruit number per vine	93124.66**	9209.74
10	Number of seeds per fruit	3353.90**	600.75
11	Total soluble solids (° Brix)	1.86 **	0.20
12	Total carbohydrate content (g /100 g)	2.49**	0.40
13	Protein content (g /100 g)	1.53 **	0.32
14	Crude fibre (%)	3.34**	0.11
15	Yield per vine (kg)	62.15**	2.98

\*\* Significant at 1% level

\* Significant at 5% level

NS –Non significant

**Table.21.Genotypic correlation coefficients for yield and yield components in ivy gourd**

	<b>X1</b>	<b>X2</b>	<b>X3</b>	<b>X4</b>	<b>X5</b>	<b>X6</b>	<b>X7</b>	<b>X8</b>	<b>X9</b>	<b>X10</b>	<b>X11</b>	<b>X12</b>	<b>X13</b>	<b>X14</b>	<b>X15</b>
<b>X1</b>	1.000	-1.291**	-0.686	0.295	-1.622**	0.803*	0.563	1.018**	0.585	1.232**	0.291	0.368	0.579	0.060	1.153**
<b>X2</b>		1.000	0.233	-0.719	1.921**	-1.311**	-1.061**	-1.379**	-0.040	-1.727**	-0.147	-0.675	-1.117**	-0.026	-1.333**
<b>X3</b>			1.000	0.834*	0.173	0.361	0.279	-0.322	-1.004**	-0.097	-1.049**	0.141	-0.323	-0.105	-0.467
<b>X4</b>				1.000	-0.258	0.711	0.705	0.131	-0.857*	0.467	-0.554	0.667	-0.384	0.106	0.173
<b>X5</b>					1.000	-1.200**	-1.119**	-1.470**	-0.297	-1.666**	-0.534	-0.823*	-1.561**	0.241	1.362**
<b>X6</b>						1.000	0.886**	0.804*	-0.362	1.058**	0.087	0.658	0.361	0.124	0.800*
<b>X7</b>							1.000	0.627	-0.329	0.796*	0.332	0.961**	0.178	-0.076	0.515
<b>X8</b>								1.000	0.424	1.019**	0.360	0.353	0.682	0.211	1.048**
<b>X9</b>									1.000	0.690	0.171	-0.129	0.748	0.124	0.444
<b>X10</b>										1.000	0.251	0.592	0.677	-0.010	1.079**
<b>X11</b>											1.000	0.376	0.532	-0.285	0.226
<b>X12</b>												1.000	0.174	-0.501	0.261
<b>X13</b>													1.000	-0.483	0.687
<b>X14</b>														1.000	0.255
<b>X15</b>															1.000

\*\* Significant at 1% level

\* Significant at 5% level

**X1-** Vine length  
appear

**X2-**Days to first female flower appearance

**X3-**Node number at which first female flower

**X4-**Inter nodal length

**X5-**Days to first harvest

**X6-**Fruit weight

**X7-**Fruit length

**X8-** Fruit girth

**X9-**Fruit numbers per vine

**X10-**Number of seeds per fruit

**X11-**TSS

**X12-**Total carbohydrate

**X13-**Protein content

**X14-**Crude fiber

**X15-**Yield per vine

## ANNEXURE I

### Weather Data during crop growth period (June 2008 to May 2009)

S.No.	Months	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	No. of rainy days	Sunshine (hrs)	Evaporation (mm)	Solar radiation (cal/cm <sup>2</sup> /day)	Wind Speed (km/hr)
		Max.	Min.	Morn.	Eve.						
1	June	32.1	23.6	77	51	21.4	2	4.4	6.6	344.3	11.5
2	July	31.3	23.1	82	54	27.8	3	5.8	5.8	355.2	9.7
3	August	31.8	22.7	88	54	66.3	4	5.0	5.4	334.6	7.8
4	September	31.5	21.7	84	52	26.3	4	7.1	5.5	383.0	7.0
5	October	28.2	22.0	91	62	312.9	14	5.5	3.8	321.1	4.0
6	November	30.2	20.8	91	55	43.6	5	5.6	3.3	356.8	3.8
7	December	28.6	19.2	90	51	11.1	1	6.4	3.3	373.4	4.7
8	January	30.0	18.7	90	39	-	-	8.9	4.9	452.1	5.8
9	February	33.5	19.2	82	28	-	-	10.0	6.3	476.9	5.2
10	March	34.6	21.4	83	34	101.8	3	8.2	5.9	418.8	4.5
11	April	35.6	24	83	38	-	-	7.3	6.0	387.4	10
12	May	34.8	23.8	87	47	104.6	5	7.5	6.0	379.5	5.5

Fig.1. Mean performance of seven ivy gourd genotypes for vine length (m)

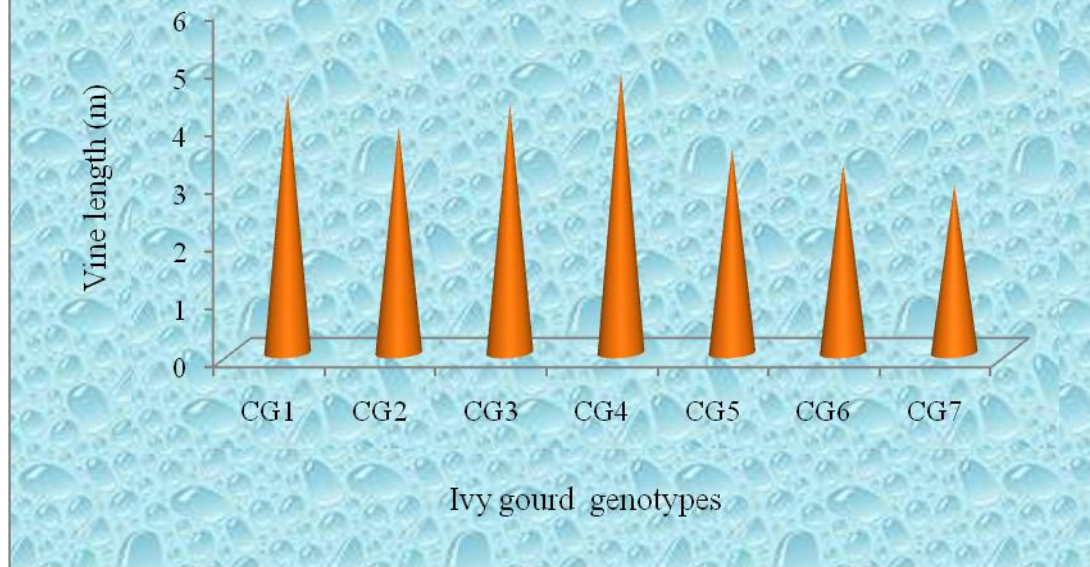


Fig.2. Mean performance of seven ivy gourd genotypes for days to first female flower appearance

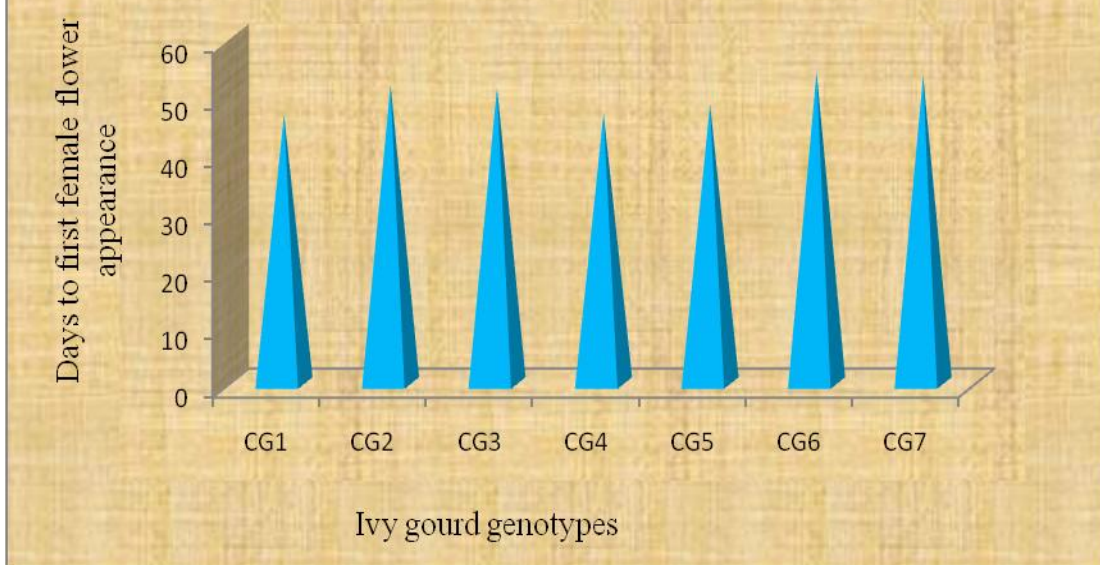


Fig.3. Mean performance of seven ivy gourd genotypes for node number at which first female flower appearance

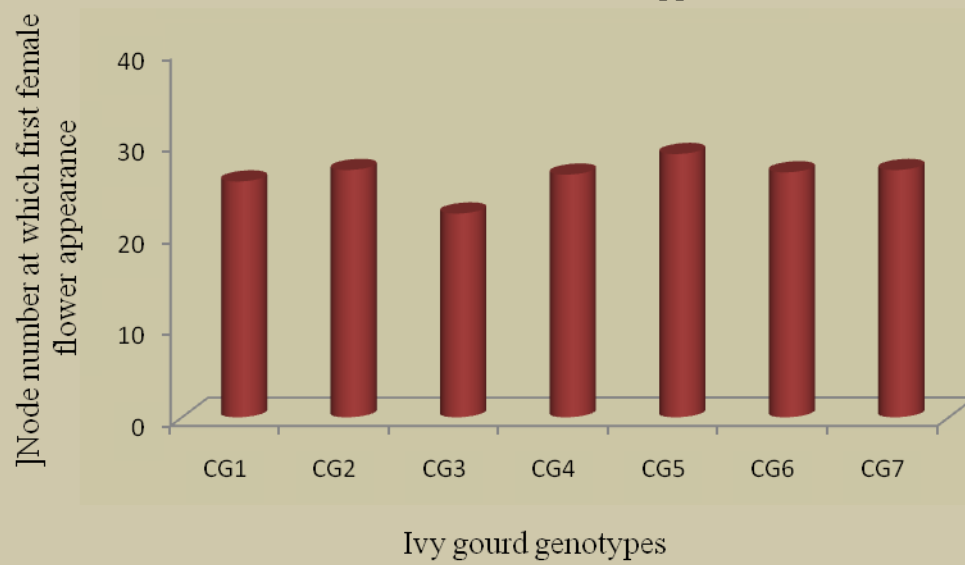


Fig.4. Mean performance of seven ivy gourd genotypes for inter nodal length (cm)

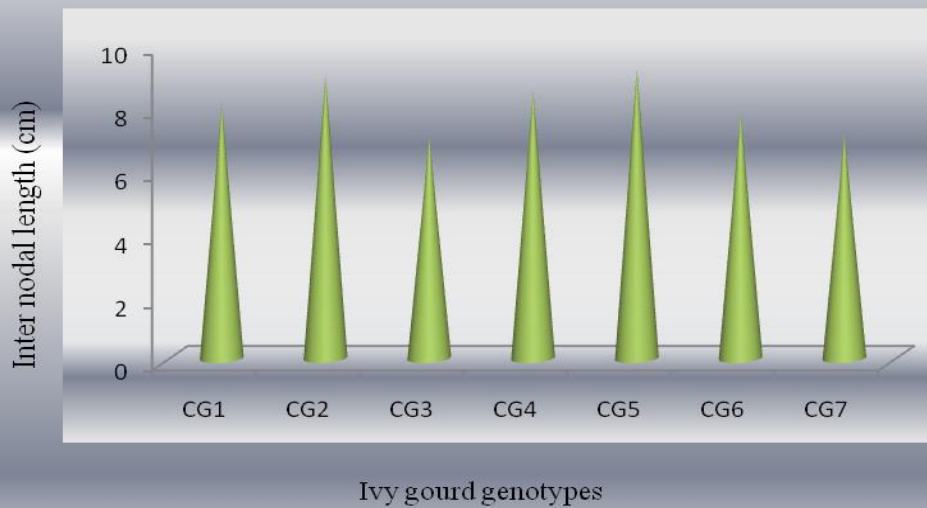


Fig.5. Mean performance of seven ivy gourd genotypes for days to first harvest

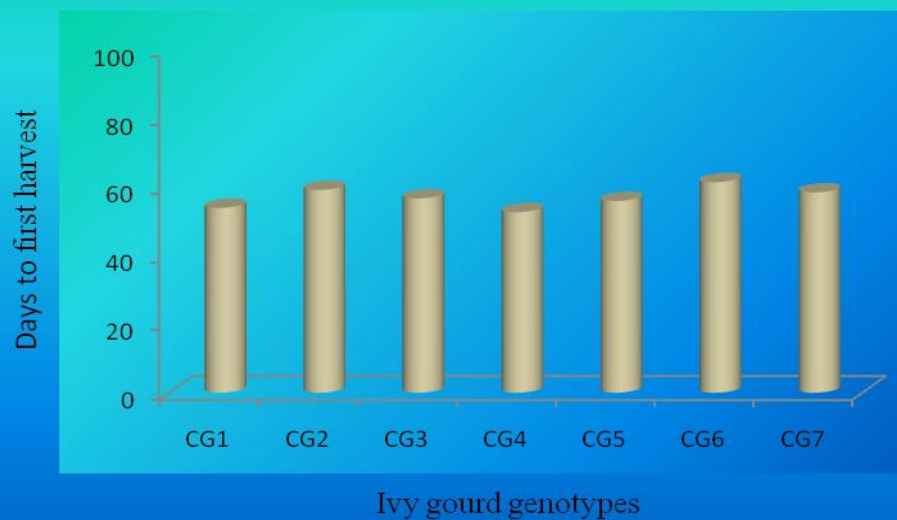
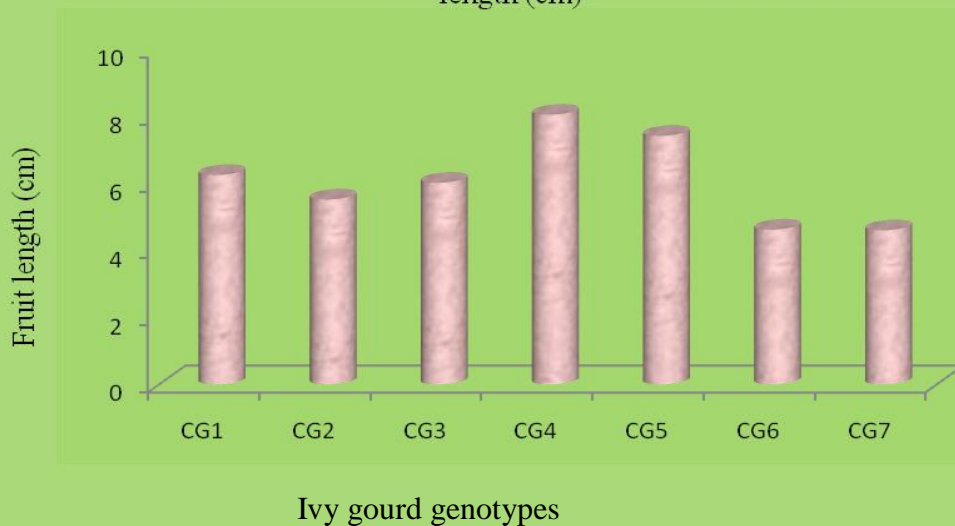


Fig.6. Mean performance of seven ivy gourd genotypes for fruit length (cm)



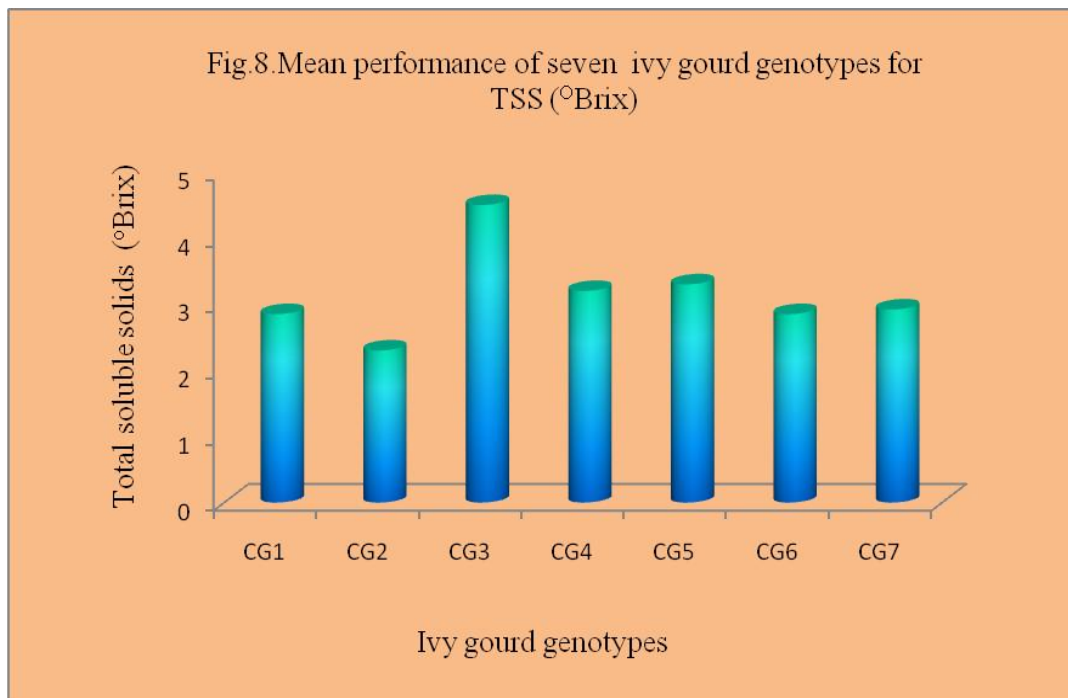
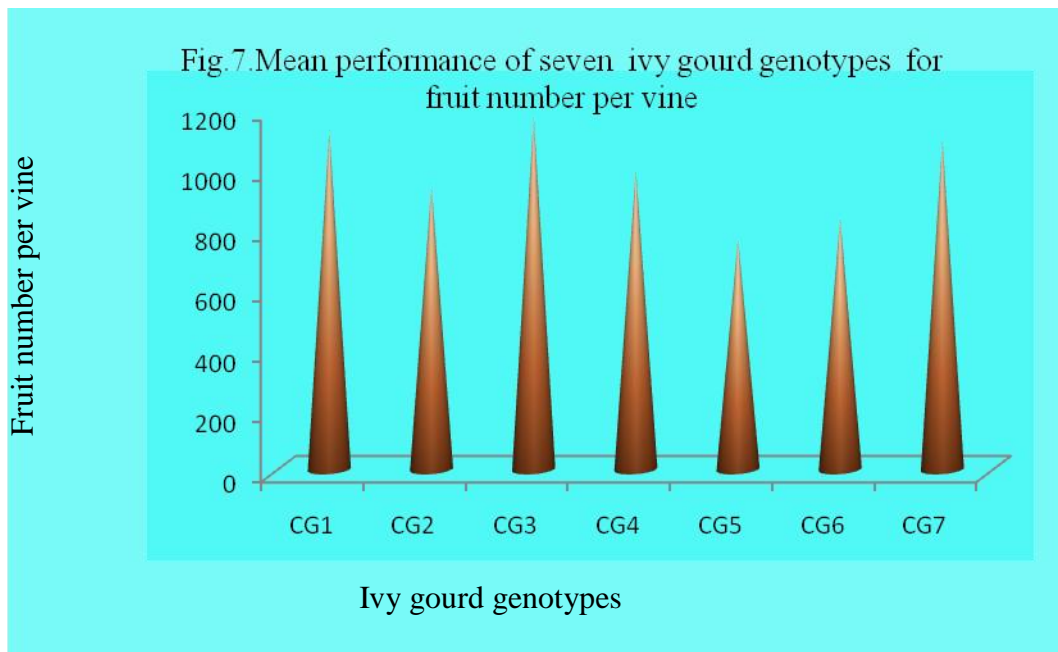


Fig.9. Mean performance of seven ivy gourd genotypes for Protein content (g )

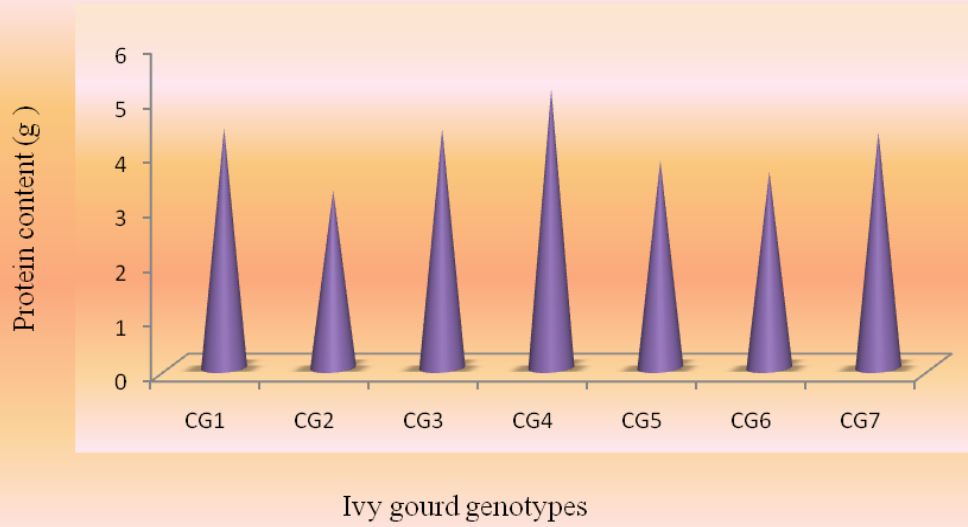


Fig.10. Mean performance of seven ivy gourd genotypes for yield per vine (kg)

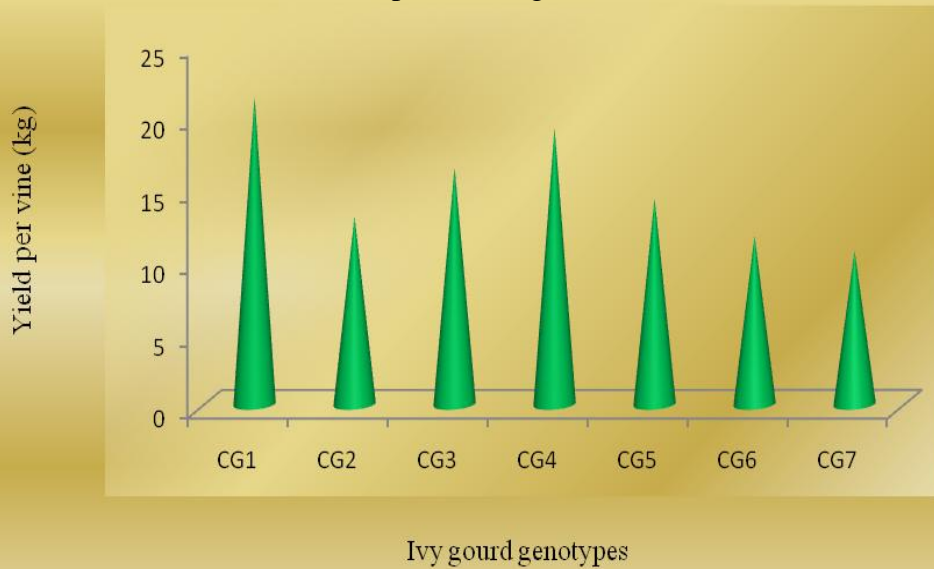
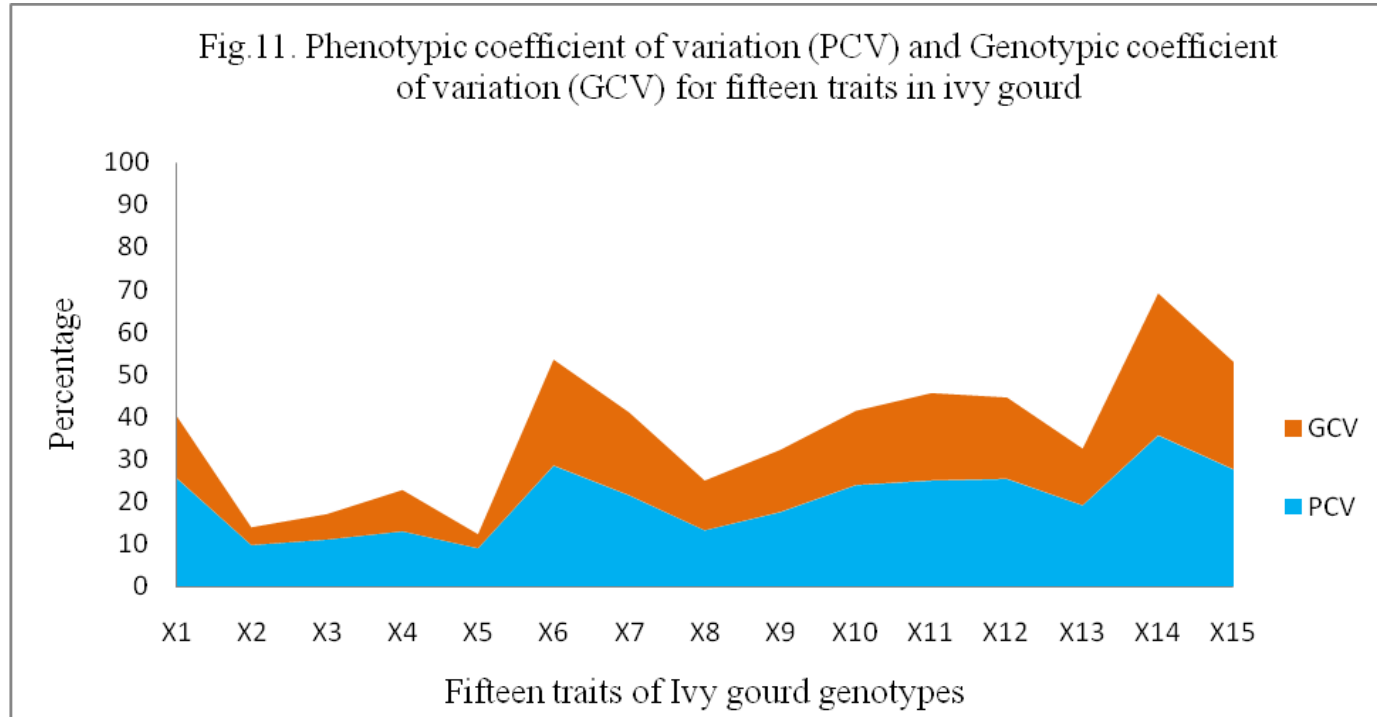


Fig.11. Phenotypic coefficient of variation (PCV) and Genotypic coefficient of variation (GCV) for fifteen traits in ivy gourd



**X1-** Vine length

**X4-** Inter nodal length

**X7-** Fruit length

**X10-** Number of seeds per fruit

**X13-** Protein content

**X2-** Days to first female flower appearance

**X5-** Days to first harvest

**X8-** Fruit girth

**X11-** TSS

**X14-** Crude fiber

**X3-** Node number at which first female flower appear

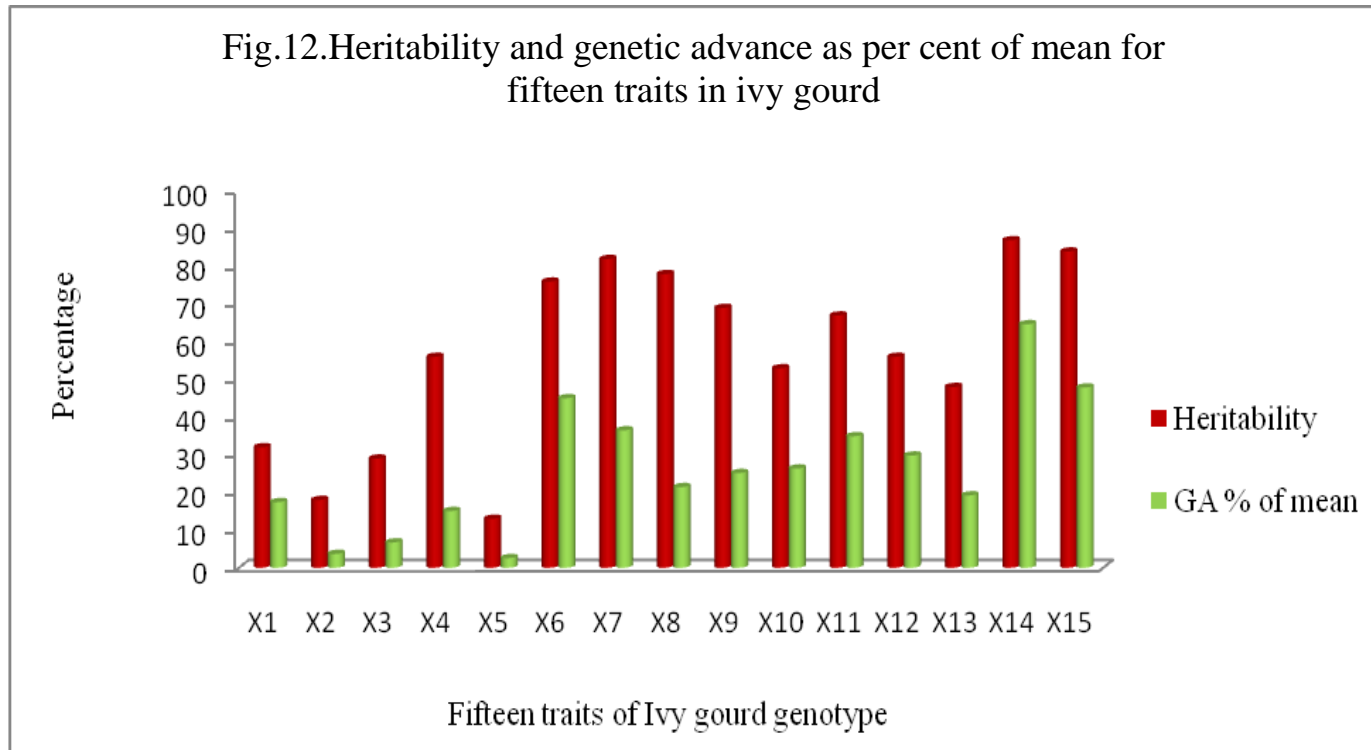
**X6-** Fruit weight

**X9-** Fruit number per vine

**X12-** Total carbohydrate

**X15-** Yield per vine

Fig.12.Heritability and genetic advance as per cent of mean for fifteen traits in ivy gourd



**X1-** Vine length

**X4-**Inter nodal length

**X7-**Fruit length

**X10-**Number of seeds per fruit

**X13-**Protein content

**X2-**Days to first female flower appearance

**X5-**Days to first harvest

**X8-** Fruit girth

**X11-**TSS

**X14-**Crude fiber

**X3-**Node number at which first female flower appear

**X6-**Fruit weight

**X9-**Fruit number per vine

**X12-**Total carbohydrate

**X15-**Yield per vine

**Plate 6a. Promising genotypes having increased fruit length**



**Plate 6b. Promising genotypes with less seed content in fruits**



**Plate 6c. Promising genotypes having increased fruit weight**



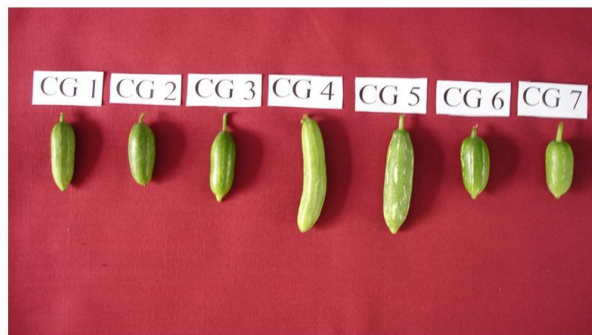
**Plate 4a. Phenotypic variability in leaves of Ivy gourd**



**Plate 4b. Phenotypic variability in flowers of Ivy gourd**



**Plate 4c. Phenotypic variability in fruits of Ivy gourd**



**Plate 3a. Field view of Ivy gourd genotypes before pruning**



**Plate 3b. Field view of Ivy gourd genotypes after pruning**



**Plate 2. Ivy gourd genotypes CG 1 to CG 7 used in the study**



**Plate 1a. Nursery view of Ivy gourd**



**Plate 1b. Field view of the experimental plot**



**Plate 5a. Promising genotypes with less internodal length**



**CG-3**



**CG-7**



**CG-6**

**Plate 5b. Promising genotype with early maturity**



**CG-4**

**Plate 7a. Promising genotype for high yield**



**Plate 7b. Promising genotype for high TSS**



**Plate 7c. Promising genotype for high protein content**

