

**Popular Insecticides for Management of Sucking Pests in
Cotton in Telangana**
**तेलंगाना में कपास में चूसने वाला कीट के प्रबंधन के लिए
लोकप्रिय कीटनाशक**

GANJI SAI REDDY

PROJECT REPORT

**Master of Business Administration
(Agri Business)**



उत्तमा वृत्तिस्तु कृषिकर्मेव

2021

**Institute of Agri Business Management
Swami Keshwanand Rajasthan Agricultural University
Bikaner – 334006**

**Popular Insecticides for Management of Sucking Pests in
Cotton in Telangana**

**तेलंगाना में कपास में चूसने वाला कीट के प्रबंधन के लिए
लोकप्रिय कीटनाशक**

Ganji Sai Reddy

PROJECT REPORT

**Master of Business Administration
(Agri Business)**



उत्तमा वृत्तिस्तु कृषिकमेव

2021

**Institute of Agri Business Management
Swami Keshwanand Rajasthan Agricultural University
Bikaner – 334006**

**Popular Insecticides for Management of Sucking Pests in
Cotton in Telangana**

**तेलंगाना में कपास में चूसने वाला कीट के प्रबंधन के लिए
लोकप्रिय कीटनाशक**

PROJECT REPORT

Submitted to the

Swami Keshwanand Rajasthan Agricultural University, Bikaner

In partial fulfillment of the requirement for the degree of

Master of Business Administration

(Agri Business)

By

Ganji Sai Reddy

2021

INSTITUTE OF AGRI BUSINESS MANAGEMENT
SWAMI KESHWANAND RAJASTHAN AGRICULTURAL UNIVERSITY, BIKANER

CERTIFICATE – I

Date:

This is to certify that **Mr. Ganji Sai Reddy** had successfully completed the Comprehensive Examination held on as required under the regulation for the degree of Master of Business Administration (Agri Business).

DIRECTOR, IABM

INSTITUTE OF AGRI BUSINESS MANAGEMENT
SWAMI KESHWANAND RAJASTHAN AGRICULTURAL UNIVERSITY, BIKANER

CERTIFICATE-II

Date:

This is to certify that this project report entitled “**Popular Insecticides for Management of Sucking Pests in Cotton in Telangana**” submitted for the degree of Master of Business Administration (Agri Business) in the field of embodies bonafide project work carried out by **Mr. Ganji Sai Reddy** under our guidance and supervision and that no part of this project report has been submitted for any other degree. The assistance and help received during the course of investigation have been fully acknowledged. The draft of this project report was also approved by the Advisory Committee on

(Amita Sharma)
Major Advisor

DIRECTOR, IABM

INSTITUTE OF AGRI BUSINESS MANAGEMENT
SWAMI KESHWANAND RAJASTHAN AGRICULTURAL UNIVERSITY, BIKANER

CERTIFICATE- III

Date:

This is to certify that project report entitled “**Popular Insecticides for Management of Sucking Pests in Cotton in Telangana**” submitted by **Mr. Ganji Sai Reddy** to the Swami Keshwanand Rajasthan Agricultural University, Bikaner in partial fulfilment of requirement for degree of Master of Business Administration (Agri Business) after recommendation by the external examiner was defend by the candidate before the following members of the evaluation committee. The performance of the candidate in the oral examination on his project report has been found satisfactory. We therefore, recommend that the project report be approved.

(Amita Sharma)
Major Advisor

(Vikram Yogi)
Member

(Satyveer Singh Meena)
Member

(S.R. Yadav)
Dean PGS Nominee

Recommended for approval

DIRECTOR, IABM

Approved

Dean,
Post Graduate Studies

Format of correction certificate to be included in the thesis

INSTITUTE OF AGRI BUSINESS MANAGEMENT

SWAMI KESHWANAND RAJASTHAN AGRICULTURAL UNIVERSITY, BIKANER

CERTIFICATE – IV

Dated:

This is to certify that **Mr. Ganji Sai Reddy** of the Institute of Agri Business Management, Bikaner has made all the corrections/modifications in his project report entitled “**Popular Insecticides for Management of Sucking Pests in Cotton in Telangana**”, which were suggested by the Advisory Committee in the oral examination held on The final copies of the project report duly bound and corrected were submitted on and are enclosed herewith for approval.

Advisory Committee:

(Amita Sharma)
Major Advisor

(Vikram Yogi)
Member

(Satyveer Singh Meena)
Member

(S. R. Yadav)
Dean PGS Nominee

Recommended for approval

DIRECTOR, IABM

Approved

Dean,
Post Graduate Studies

**SWAMI KESHWANAND RAJASTHAN AGRICULTURAL UNIVERSITY, BIKANER
INSTITUTE OF AGRI BUSINESS MANAGEMENT**

CERTIFICATE-V

The under signed assigns to Swami Keshwanand Rajasthan Agricultural University, Bikaner all right under copyright that may exist in and for the thesis entitled “**Popular Insecticides for Management of Sucking Pests in Cotton in Telangana**”submitted by me to Swami Keshwanand Rajasthan Agricultural University, Bikaner for the award of the **Master of Business Administration in Agri Business**.

(Ganji Sai Reddy)



Institute of Agribusiness Management, SKRAU Campus, Bikaner
Certificate of Plagiarism Check for Thesis

Author Name	Ganji Sai Reddy
Course of Study	MBA (Agri Business)
Name of Major Supervisor	Dr. Amita Sharma
Department	Institute of Agri Business Management
Acceptable Maximum Limit	20%
Submitted By	amita@iabmbikaner.org
Paper Title	Popular Insecticides for Management of Sucking Pests in Cotton in Telangana
Similarity	12%
Paper ID	387486
Submission Date	2021-09-28 12:13:09

Signature of Student

Signature of Major Advisor

Head of the Department

University Librarian

Director Of Post Graduate Studies

*** This report has been generated by DrillBit Anti-Plagiarism Software**

The following certificate will be submitted by the concerned HOD to the Dean, PGS.

S. K. RAJASTHAN AGRICULTURAL UNIVERSITY, BIKANER

PLAGIARISM VERIFICATION CERTIFICATE

Name of The student: _____

Admn. No. & Date of Registration: _____

Name of the Degree: _____

Name of the Department & College: _____

Name of the Major Advisor with Designation: _____

Similarity percentage _____ Date _____

Major Advisor

The Plagiarism report of the above thesis has been reviewed and similarity percentage is below the accepted norms (**report attached**). The thesis may be considered for submission to the university.

Director

(Anti-plagiarism will be applicable to all the PG students)

Acknowledgement

A precious debt as that of learning is the only debt that is difficult to repay except through gratitude with limitless humanity. Every effort is motivated by ambitions and all ambitions have inspiration behind. I owe this pride place to my parents who always believed in giving strong educational wings to their daughter.

*I feel bereft of syllable to explicate my sincere gratitude and profound personal regards to my major advisor **Dr. Amita Sharma, Assistant Professor, Institute of Agri Business Management** for the supervision of the work and for the invaluable guidance, the long time and tremendous effort to offer every possible help to finish this project.*

*With deep sense of pride and dignity, I express my adoration and deep sense of gratitude to all my advisory committee members **Dr. Vikram Yogi, Assistant Professor, College of Agriculture, Dr. Satyveer Singh Meena, Assistant Professor, Institute of Agri Business Management** and Dean PGS nominee **Dr. S.R. Yadav, Dean PGS Nominee, SKRAU** for their valuable guidance and undoubted effort exerted during supervision of the project.*

*I owe my sincere thanks to members **Dr. Madhu Sharma, Professor and Director, Institute of Agri Business Management, Dr. Deepali Dhawan, Dean Post Graduate Studies, SKRAU, Bikaner** for their support and contribution towards providing necessary facilities for conducting the present research work.*

All these words will be futile and less meaningful, if I forget to acknowledge the nice company and untiring help of my friends, juniors and seniors as they provided me a constant source of inspiration with earnest affection and kind co-operation.

Date:

Place: Bikaner

(Ganji Sai Reddy)

Contents

Sr. No.	Titles	Page No.
	List of Tables	
	List of Figures	
	List of Appendices	
	Executive Summary (English)	
	Executive Summary (Hindi)	
1.	Introduction	1-4
2.	Review of Literature	5-9
3.	Research Methodology	10-13
4.	Findings and Analysis	14-26
5.	Conclusions	27
6.	Bibliography	28-29
	Appendices	i-viii

List of Figure

S.no	Chart	Page No.
1	Top 10 States in Cotton production in India (2015-16)	2
2	Area and average yield of Cotton crop	3
3	Khammam District Map	12
4	Warangal District Map	13
5	Irrigation source available in study area	14
6	Plant Protection consultation by farmer	16
7	Sucking pest severity in cotton by farmers	17
8	Major molecules for control of Aphids	19
9	Major molecules for control of Jassids	20
10	Major molecules for control of Mealy Bug	21
11	Major molecules for control of White Fly	22
12	TOM awareness of companies by dealers/distributors	22
13	Farmers' awareness of major insecticide brands	23
14	Factors influencing selling of product by dealers/ distributors	24
15	Agrochemical attribute preferred by farmer for purchasing	24
16	Factors considered for buying insecticide by farmer	25
17	Promotional Activity Rating by dealers/distributors	18

List of Tables

S.no	Tables	Page No.
1	Area, yield of cotton across different countries from 2015-16 to 2017-18	1
2	Percentage of area under cotton cultivation across different states	3
3	State wise area under Cotton crop from 2014-15 to 2017-18 (In Lakh ha)	4
4	Land holding of farmers	14
5	Time of sowing of cotton by farmers	15
6	Market potential of major cotton sucking pest segment insecticides in Warangal and Khammam	18
7	Top 3 Brands for control of Aphids	19
8	Top 3 Brands for control of Jassids	20
9	Top 3 Brands for control of Mealy Bug	21

List of Appendices

Annexure No.	Title	Page No.
1	Schedule for Farmers	i-iv
2	Schedule for Dealers and Retailers	v-viii

EXECUTIVE SUMMARY

India is being an Agrarian economy. Optimum utilization of agricultural inputs is necessary to achieve food security and sustainability of farm business. The project analyses the impact of pricing on agricultural inputs that will leads to dealers' expectations from company and degree of satisfaction. Price as being the most sensitive of marketing, it will highly influence the buying pattern of customers and the satisfaction among channel partners. This will not only maintains a healthy relation between company and channel partners but also helps in building better Brand image. Prime agenda of this study is to analyze price sensitivity of agriculture inputs and to measure expectations of dealers. It also covers the competitive strategies applied by the other companies for promotion of various inputs and distribution of margins. Further it deals with business opportunities available study area to meet the future demand of products.

Competitive analysis of the products and promotional activities are collected in this study. In this study we identifying the awareness level among farmers and retailers regarding the major brands available for control of cotton pests. Company promotes the products through promotional activities in rural area where product get more visibility of target customers. This study is carried out in major cotton growing districts of Telangana state to identify the major insecticides in cotton market.

Main objectives of the company in current competitive market is to understand needs of their customer and provide possible solutions. To make themselves as major shareholders in the market to survive for long period and gain trust from its stake holders. Companies also try to compete with its opposition in terms of product prices, placement, promotional activities and many other services. For understand each market research is the efficient tool to get enough information to prepare strategy to overcome it competitors.

कार्यकारी सारांश

भारत कृषि प्रधान अर्थव्यवस्था है। खाद्य सुरक्षा और कृषि व्यवसाय की स्थिरता प्राप्त करने के लिए कृषि आदानों का इष्टतम उपयोग आवश्यक है। परियोजना कृषि आदानों पर मूल्य निर्धारण के प्रभाव का विश्लेषण करती है जिससे कंपनी से व्यापारीकी अपेक्षाएं और संतुष्टि की डिग्री प्राप्त होगी। मूल्य विपणन के प्रति सबसे संवेदनशील होने के कारण, यह ग्राहकों के खरीद कारण और चैनल भागीदारों के बीच संतुष्टि को अत्यधिक प्रभावित करेगा। यह न केवल कंपनी और प्रणाली भागीदारों के बीच एक स्वस्थ संबंध बनाए रखेगा बल्कि बेहतर ब्रांड छवि बनाने में भी मदद करेगा। इस अध्ययन का मुख्य एजेंडा कृषि आदानों की मूल्य संवेदनशीलता का विश्लेषण करना और व्यापारीकी अपेक्षाओं को मापना है। इसमें अन्य कंपनियों द्वारा विभिन्न निवेशों को बढ़ावा देने और मार्जिन के वितरण के लिए लागू प्रतिस्पर्धी रणनीतियों को भी शामिल किया गया है। इसके अलावा यह उत्पादों की भविष्य की मांग को पूरा करने के लिए उपलब्ध अध्ययन क्षेत्र में व्यापार के अवसरों से संबंधित है।

इस अध्ययन में उत्पादों और प्रचार गतिविधियों का प्रतिस्पर्धी विश्लेषण एकत्र किया जाता है। इस अध्ययन में हमने कपास कीटों के नियंत्रण के लिए उपलब्ध प्रमुख ब्रांडों के बारे में किसानों और खुदरा विक्रेताओं के बीच जागरूकता स्तर की पहचान की है। कंपनी ग्रामीण क्षेत्र में प्रचार गतिविधियों के माध्यम से उत्पादों को बढ़ावा देती है जहां उत्पाद को लक्षित ग्राहकों की अधिक दृश्यता मिलती है। यह अध्ययन तेलंगाना राज्य के प्रमुख कपास उत्पादक जिलों में कपास बाजार में प्रमुख कीटनाशकों की पहचान करने के लिए किया जाता है।

मौजूदा प्रतिस्पर्धी बाजार में कंपनी का मुख्य उद्देश्य अपने ग्राहकों की जरूरतों को समझना और संभावित समाधान प्रदान करना है। लंबे समय तक जीवित रहने और अपने हितधारकों से विश्वास हासिल करने के लिए खुद को बाजार में प्रमुख शेयरधारक बनाने के लिए। कंपनियां उत्पाद की कीमतों, प्लेसमेंट, प्रचार गतिविधियों और कई अन्य सेवाओं के मामले में इसके विरोध के साथ प्रतिस्पर्धा करने की कोशिश करती हैं। यह समझने के लिए कि प्रत्येक बाजार अनुसंधान अपने प्रतिस्पर्धियों पर काबू पाने के लिए रणनीति तैयार करने के लिए पर्याप्त जानकारी प्राप्त करने के लिए कुशल उपकरण है।

Introduction of Cotton Crop

India used to be the highest importer of cotton in the 1970's. With government support in terms of schemes for cotton cultivation and an increase in area under hybrid cotton cultivation, India became self-sufficient. An increase in area under cotton cultivation and productivity of the crop, along with an increase in demand for cotton, has also occurred. When we consider the productivity of the cotton crop, India has very low productivity compared to the top country in terms of productivity. Whereas in terms of area under cotton cultivation, India is in a position with 41%. Cotton production is occurring in about 8 lakh hectares in India. 75% of the cotton produced worldwide is consumed only in Asian countries, of which India consumes about 20% of the worldwide cotton produced.

Table 1: Area, yield of cotton across different countries from 2015-16 to 2017-18

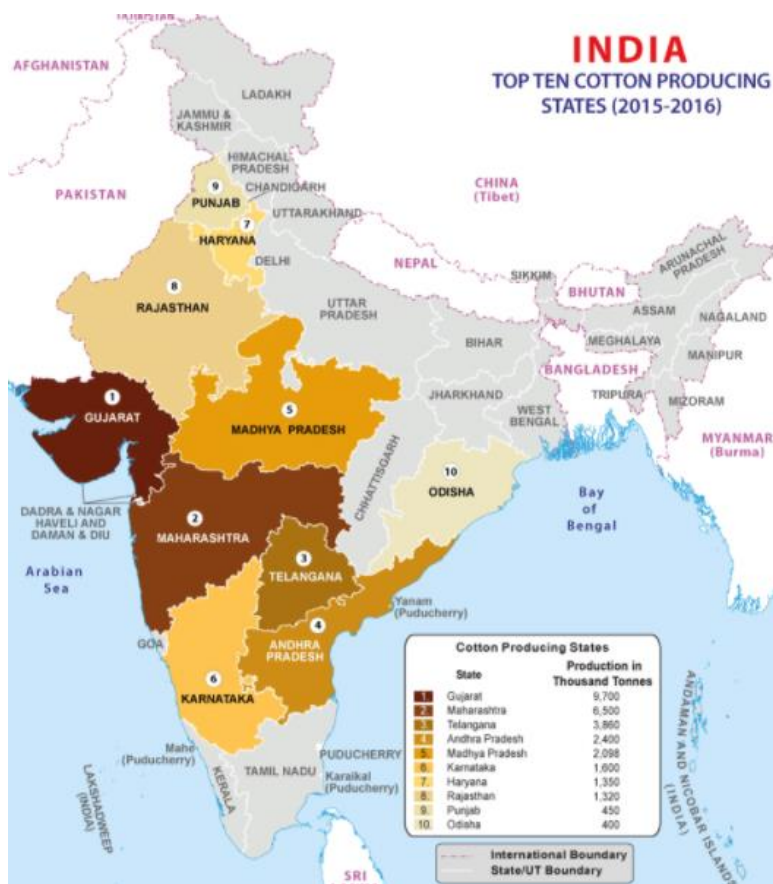
Country	2015-16		2016-17		2017-18	
	Area (in Million ha)	Yield (kg/ha)	Area (in Million ha)	Yield (kg / ha)	Area (in Million ha)	Yield (kg/ ha)
China	3.41	1524	3.1	1581	3.35	1758
India	11.88	484	10.85	541	12.24	519
USA	3.27	859	3.85	972	4.49	1014
Pakistan	2.9	530	2.5	666	2.67	674
Brazil	0.96	1350	0.94	1629	1.18	1707
Uzbekistan	1.3	641	1.25	631	1.21	662
Vietnam	0	460	0	750	0	1000
Bangladesh	0.04	652	0.04	665	0.05	764
Others	6.9	584	7.34	620	8.02	654
World total	30.66	701	29.87	773	33.2	804

Source: <https://cotcorp.org.in/statistics.aspx> (2019)

According to Table 1, the area under cultivation of cotton in India is more than any other country in the world, but productivity is less than 500 kg per hectare, which is the second lowest yield among cotton-producing countries.

Cotton crop is the most important cash crop in India, about 6 million farmers, 40-50 million people are benefited by cotton production and cotton processing industries. India has different climatic zones and vast area under black alluvial soil. Reasons for low productivity of cotton in India compared to other major cotton producing countries are due to lack of proper price for cotton, pest infestation and lack of technology.

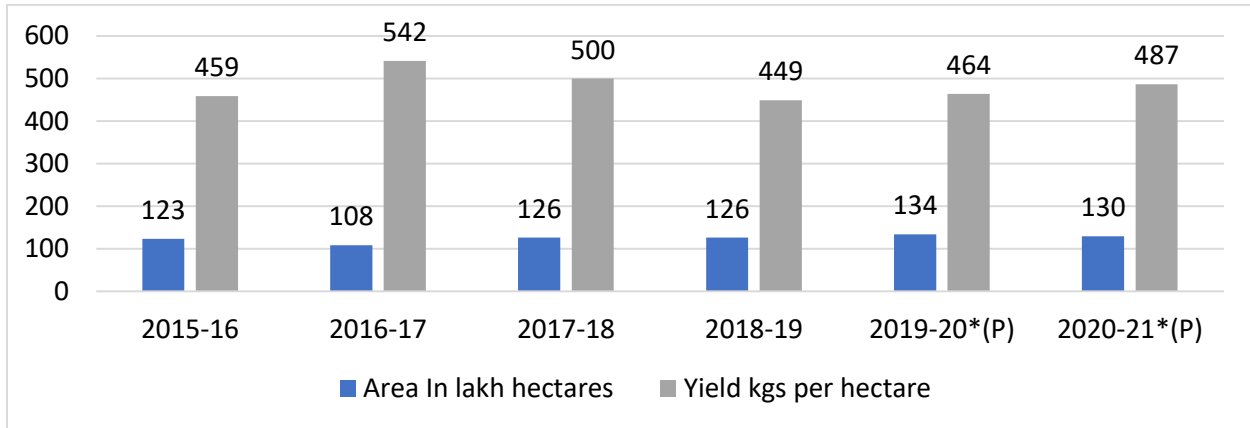
Figure 1: Top 10 States in Cotton production in India (2015-16)



Sources: <http://www.mospi.gov.in> (2018)

Majority of cotton producing area comes under rain fed area (Rain fed cotton crop in central and Southern states of the country) and outbreak of severe pest attack. Decrease in the minimum support price, increase in cost of cultivation compared to the return in cotton yield. According to Cotton Advisory board and Directorate of Economics & Statistics, Telangana state stands 3rd in overall cotton Cultivation in the country with 1.9 million acres of area.

Figure 2: Area and average yield of Cotton crop



Source: https://cotcorp.org.in/national_cotton.aspx (2021)

As shown in the figure 2 average yield of the cotton crop is not consistent over the years and it's been decreasing with increase in new pest infestations across different geographies of the country. Area under cotton cultivation is also impacted with the same factors influencing the productivity.

Table 2: Percentage of area under cotton cultivation across different states

Sr. No	State	Percent share (%)	Area (Million ha)
1	Maharashtra	34%	4.21
2	Gujarat	21%	2.62
3	Telangana	15%	1.90
4	Andhra Pradesh	5%	0.64
5	Rajasthan	5%	0.58
6	Madhya Pradesh	5%	0.60
7	Haryana	5%	0.67
9	Others	9%	1.2

Source: <http://cicr.org.in/database/dbcapp5.html> (2020)

From above table 2, we can see Telangana state is top third cotton producing state in terms of area. Over the years area under cotton cultivation has been decreasing with increase of water availability and labour unavailability. Farmers are shifting towards other crops like paddy and horticulture crops with water availability.

Table 3: State wise area under Cotton crop from 2014-15 to 2017-18 (In Lakh ha)

States	2014-15	2015-16	2016-17	2017-18	2018-19
Andhra Pradesh	8.2	6.7	4.7	6.4	6.2
Gujarat	27.7	27.2	23.8	26.2	26.6
Haryana	6.5	6.2	5.7	6.7	6.3
Karnataka	8.8	6.4	5.1	5.5	7.2
Madhya Pradesh	5.7	5.6	6.0	6.0	4.5
Maharashtra	41.9	42.1	38	42.1	42.2
Orissa	1.3	1.3	1.4	1.5	1.4
Punjab	4.2	3.4	2.9	2.9	3.4
Rajasthan	4.9	4.5	4.7	5.8	5.0
Tamil Nadu	1.9	1.4	1.4	1.9	1.7
Telangana	17.1	17.7	14.1	19	17.0
Others	0.3	0.5	0.5	0.5	0.5
Total	128.5	122.9	108.3	124.4	121.7

Source: <http://cicr.org.in/database/dbcapp5.html> (2020)

Table no 3 clearly shows about India's top three cotton producing states as Maharashtra, Gujarat and Telangana. Soil conditions and Climatic conditions in these states are very much favourable for cotton crop production. In top cotton producing states like Gujarat, Maharashtra and AP there is no significant change in the area under cultivation of cotton but there is about 10% less area under cultivation of cotton crop in Telangana when compare to year 2017-18 and 2018-19.

2. Review of Literature

Sharma and Pampapathy (2006) stated that the greater susceptibility of some of the transgenic hybrids to jassids, and the relatively early maturity, the advantage of transgenics over the commercial varieties was not evident, except under high levels of *H. armigera* infestation during the 2004 cropping season. Therefore, for transgenic cottons to be an important component in integrated pest management, it is important to transform varieties or hybrid parents that have less susceptibility to the target and/or non-target insect pests to reduce the number of insecticide application for sustainable crop protection.

Morse et al. (2007) explored the impact of insect-resistant *Bacillus thuringiensis* (Bt) cotton has shown cost effective results just after two years of release in Maharashtra State, India. It is the first research conducted in India based on farmers' own practices rather than trial plots. Overall, the gross margins of Bt plots were some 43 percentage (2002) and 73 percentage (2003) higher than those of non-Bt plots, although there was some variation between the three different geographies of the Maharashtra state. The results showed that farmers are having effective growth in yield and better pest control for last two years.

Prasad et al. (2009) conducted research at Regional Agricultural Research Station at Guntur on evaluations of first generation Bt hybrids released in India for reaction to pest complex of cotton under unprotected conditions. Results of this study shown that transgenic BT cotton doesn't afford any protection for sucking pests in cotton. *Helicoverpa armigera* incidence was completely absent in RCH 144 Bt as no square damage was recorded followed by lower incidence in RCH 2 Bt (3.3%) and RCH 20 Bt(5.95%). Whereas non Bt versions of RCH 2(7.53%), RCH 20(11.95%) and RCH 144(9.0%) recorded higher damage and significantly differed from their respective Bt counter parts. Another finding of this research has shown that pink ball worm incidence is lower than the green ball worm. Which is important to control losses incurred by lower quality link produced.

Ramanjaneyulu et al. (2010) found that pests and pesticides contribute to the major economic and ecological problems affecting the farmers, crops and their living environment. Two decades of experience in Andhra Pradesh on Non Pesticidal Management shows that pest is a symptom of ecological disturbance rather than a cause and can be affectively managed by using local resources and timely action. The emerging new paradigm of sustainable agriculture shows that the new knowledge synthesized from traditional practices supplemented with modern science can bring in ecological and economic benefits to the farmers. The institutional base of Community Based Organizations like Federations of Women Self Help Groups provides a good platform for scaling up ecological farming practices.

Chandel et al. (2010) reported the importance of Potato apical leaf curl virus (PALCV) in India, the biology of its major vector *Bemisia tabaci* and possible control measures of PALCV and *B. tabaci*. PALCV has appeared as a new problem in potato growing areas of north western plains of India. The first report of PALCV was made from Hissar around 2000. PALCV is a whitefly (*B. tabaci*) transmitted viral disease and the symptoms are manifested primarily in the form of upward or downward curling of leaves, with 40–75 percentage infection being recorded in cultivars grown in the Indo-Gangetic Plains of India. *B. tabaci* is a polyphagous pest that feeds on numerous fibre (particularly cotton), food, vegetable and ornamental plants. *B. tabaci* produces many generations in a year and reaches high population densities. To check the disease incidence, whitefly suppression using imidacloprid either as seed treatment or as foliar application early in the season is recommended. To minimize within -field spread of viruses, removal of virus-infected plants is suggested. Application of mineral and vegetable oils has been found to inhibit virus transmission and possibly can help to avoid difficulties with insecticide resistance in whiteflies.

Rani et al (2010) reported that the American bollworm, *Helicoverpa armigera*, Pink bollworm, *Pectinophora gossypiella*, Tobacco caterpillar, *Spodoptera litura*, jassid, *Amrasca biguttula biguttula*, whitefly, *Bemisia tabaci*, are the major pests of cotton that have the potential to reduce yield by 20-80%. The intensity of pest attack can be controlled with controlled management practises can reduce the losses due to sucking and chewing pests. For more effective results timely practises are required.

Mani (2010) studied Origin, introduction, distribution and management of the invasive spiralling whitefly in India. White fly population is more dependent on the environmental factors like rainfall and humidity. White fly density has shown negative correlation with the humidity in that area and positive correlation with the temperatures. Temporary solution for control of these pest in cotton is observed by usage of chemical like dimethoate, triazophos, monocrotophos, and cultural practices like pruning of the infested plants.

Dhillion et al. (2011) mentioned about benefits of using transgenic plants. Use of insect-resistant transgenic plants will continue to expand, and gene pyramiding might become very common in future. However, concerns have been raised about the possibility that large-scale deployment of transgenic crops for pest management might impact the arthropod diversity natural enemies, toxin flow in the insect fauna through different trophic levels, development of resistance in target insect pests, pollen flow in closely related wild relatives, antibiotic resistance, etc. But, at the same time we should also consider the risk of not using genetically modified crops for pest management and crop production, when the need to increase food production is most urgent. However, it is also important to follow the bio-safety regulations, better presentation of the benefits of biotechnology to the general public, and develop stringent risk assessment and risk management strategies for pest management and sustainable crop production.

Monga et al. (2011) studied that Cotton leaf curl virus disease caused by a single stranded circular Gemini virus consisting of DNA- A and two satellites DNA-1 and DNA beta and transmitted by white fly is an important problem of northern cotton growing region of India with area ranging from 12-20 lakh hectares in the states of Haryana, Punjab and Rajasthan during the last one and half decade. The effective management of this important disease is possible by development of resistant varieties, suppression of whitefly and eradication of weed hosts carrying this disease. The development of resistant variety /hybrid is the only reliable and cheaper method of its management, several resistant/tolerant varieties were developed by the SAUs and ICAR institutions working in the region. The hitherto known resistant varieties also showed susceptible reaction at hot spot areas.

Sridharan et al. (2016) stated that the implementation of Biointensive Pest Management (BIPM) module effectively reduced the spiralling whitefly population which showed 86.34 whiteflies per plant as compared to insecticide sprays 335.41 whiteflies per plant. The untreated check harboured 450.61 whiteflies per plant. The population reduction of spiralling whitefly achieved by BIPM was 77.03 percentage as compared to 25.89percentage in farmer's practice with two rounds of insecticide sprays. The yield of tubers in BIPM plot was 33.25t/ha which was superior to the tuber yield of 29.62 t/ha recorded in farmer's practice. The untreated plot showed a tuber yield of 25.30 t/ha. Hence it can be concluded that the adoption of BIPM is beneficial in containing the whitefly population realising a BCR ratio of 1: 3.26 in as compared to farmer's practice which showed a BCR ratio of 1:2.34.

Rathee et al (2018) stated that emerging insect problem will cause yield loss up to 15-20 percent in cash and food crops. Increase in insect infestation will increase food insecurity with their losses in food crops. Sucking insect pests and defoliators like mirid bugs, mealy bugs, whiteflies and the defoliating tobacco caterpillar on cotton; BPH, WBPH, leaf folder on rice; maize shoot fly on maize; cabbage butterfly on crucifers; tobacco caterpillar on Cole crops; tea mosquito bug on tea; gall wasp on cluster beans and aphids on wheat crop have emerged as major pests in recent years in India. Efforts must be undertaken to modify current management strategies and devise appropriate IPM measures to manage emerging insect pests and mitigate the otherwise incalculable losses, to sustain production of major crops in future.

Mahalakshmi and Prasad (2018) conducted study to identify the influence of plant spacing on incidence of major insect pests on cotton was conducted at Lam, Guntur. The incidence of sucking pests especially leafhoppers and thrips was slightly higher in close spacing i.e. under high density planting system (HDPS) when compared to recommended spacing. The incidence of bollworms was almost similar in both close and recommended spacing. The study indicated that statistically there are no significant differences between close spacing and recommended spacing regarding the incidence of insect pests, except for leafhoppers.

Meghana et al. (2018) conducted study the population dynamics of sucking insect pest complex on intra-specific and inter-specific Bt cotton hybrids at college of Agriculture, Vijayapur. Correlation with weather parameters like maximum and minimum temperature was positively correlated with thrips, aphids, jassids and whiteflies. Whereas, rainfall had negative correlation. Mirid bugs were positively correlated with maximum temperature and negatively correlated with minimum temperature, relative humidity and rainfall.

Kranthi and Stone (2020) stated that long-term trends shows that Bt cotton did make a positive contribution in India. Bt seeds sharply reduced predations by ABW, an effect that has endured due to the insect's ecology. Bt also initially provided good control of the PBW, a previously intractable late-season pest. Bt seeds were responsible for the sharp falloff in spraying for Lepidopterans beginning in 2005 when adoption first began to surge. However, we find that the technology's benefits have been modest and largely ephemeral. Bt adoption has been conspicuously incongruous with positive yield effects. Changes in other inputs, including irrigation, insecticides and especially fertilizer use, correspond better to yield rises. Moreover, Bt seeds' positive effects on spraying were fleeting. Countrywide yields have not improved in 13 years, and Indian cotton farmers are spending more per hectare on insecticide than they did before Bt began to spread.

Pandagale et al. (2020) discussed about infestation of various pests and disease incidence in high density cropping in rainfed areas, as high density cropping is recommended in rainfed areas to increase the yield per acre and duration of crop. Incidence of leaf hoppers and white flies was increased in closer spacing (45 x 10 cm) than wider row (75 x 10 cm) under high density planting system of cotton. Plant density didn't affected infestation of bollworms. Intensity of Alternaria leaf spot was increased in greater plant density. Hirsutum cotton variety NH 615 and Suraj were found to have lower incidence of sucking pests.

3. RESEARCH METHODOLOGY

Research comprises defining and redefining problems, formulating hypothesis or suggested solutions; collecting, organizing and evaluating data; making deduction and reaching conclusions; and at last carefully testing the conclusions to determine whether they fit the formulating hypothesis.

It is a way to systematically solve the research problem. It may be understood as science of studying how research is done scientifically.

3.1 Research Design

A research design is process and statement for general approach of the project. It is very important part to complete a project effectively. Research design is a plan structured and strategies of investigation.

For achievement of the objectives it was necessary to talk to farmers and trade partners for deriving the conclusions regarding the objective. For visiting the farmers and trade partners to collect the relevant information; a schedule has to be designed. The schedule was designed in such a manner to achieve the objective of the research.

3.2 Research Type

Descriptive research type was considered for completing this study. The study was completely based on particular geography and detail study problem – solution for cotton sucking pests.

3.3 Types of questions

Questions were designed to collect data from farmers and dealers/distributors according to the objectives of this study. This study consists of both open and closed ended based on information collected in the schedule.

3.4 Type of analysis

For the analysis of the data collected from this project we have followed both qualitative and quantitative methods to make this analysis more statistical.

3.5 Source of data: Majority of the information used in this project is the primary data which was collected exclusively for studying project objectives. Scope of secondary data is very less. Secondary data was collected from government and cotton research organizations' websites.

3.6 Methods of collecting primary data

3.6.1 Research Instrument for collection of data

In this project, the schedule method for collecting necessary information was used.

3.6.2 Selection of the sample/sampling techniques

For this study, two districts were selected on the basis of purposive sampling. Khammam and Warangal districts have the approximate 40% area for cotton cultivation in the state. From Khammam district, 20 villages from 10 Tehsils were considered according to the cotton cultivation area. In Warangal district, 10 villages from 6 Tehsils were covered under this study. Five farmers from each village were considered for survey according to convenient sampling. A total of 50 dealers/distributors were included for survey on the basis of judgmental sampling as per suggestions received from company and agri officials in the study area.

3.7 Analysis

Tabular analysis of the collected data was done with the help of appropriate research analysis tools. The project was carried out to fulfil the specified objectives and depending upon analysis and interpretation of facts and figures. For analysis, four objectives have been identified which are as follows

Objective 1: To study the market potential of insecticides of sucking pest segment (Jassid, aphid, whitefly, bollworms and mealy bug)

For fulfilment of this objective, data was collected regarding the cultivation land under cotton crop for estimation of most commonly used chemical in the pest management. For data collection consideration, the government organisation sources for calculation of land under total cotton crop cultivation was taken.

Objective 2: To study competitive molecules in cotton insecticides

The schedule was structured to know the most commonly used chemicals for the control of the major pest like Jassids aphids and mealy bug. For this, the data was collected from farmers and retailers/ distributors. This objective was considered to know the major chemicals molecules used for crop protection in cotton crop.

Objective 3: To study the farmers' and dealers expectations for insecticide

With the help of the schedule, the data was collected from the farmers for calculation of respondent expectation term of the chemical molecules for crop protection in cotton.

3.8.2 Warangal

Warangal is one of the largest district with four revenue divisions and also a dry district according to the government survey parameters. The major crops grown in this area are cotton, rice, chilli and groundnut etc. Cotton is cultivated in a larger area comparison to the Khammam district due to the limited irrigation sources. The major irrigation sources are tanks, bore wells and open wells. It is estimated that about 2, 80,000 acres of land is cultivated under cotton crop. Cotton crop is the most cultivated crop in the district.

Figure 4: Warangal District Map



Source: <https://www.mapsofindia.com/maps/telangana/districts/warangal.htm>

3.10 Scope of the project

- Identification of major competitors in Warangal and Khammam districts in the cotton sucking pest segment.
- Identification of activities for the promotion of the products in market
- Identification of the potential of the market
- Study of the buying behaviour of the customers
- Efficiency of the promotional activities in the target markets
- Comparison of the attributes of the market ie., product, promotion

4. Findings and Analysis

4.1 Demography profile of farmers in study area

Land holding

The maximum land holder in Khammam and Warangal districts of Telangana are small and marginal farm land holding. Recent time migration of population to the urban areas increased trend of the land lease. Land holdings are included with lease land.

Table 8: Land holding of farmers

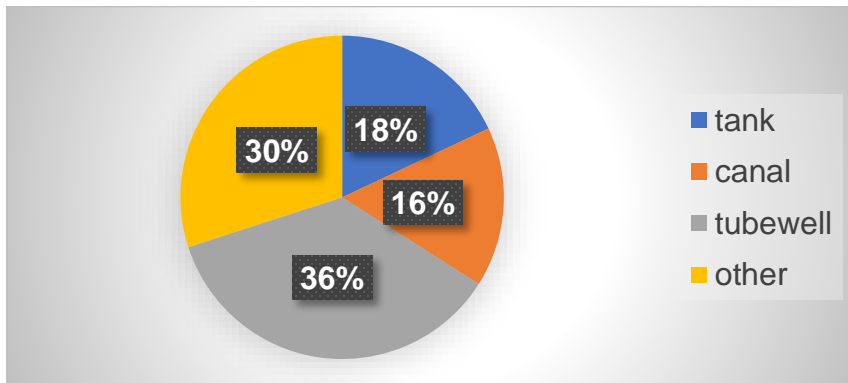
	Land holdings	Number of respondents
1	Less than or equal to 2 acre	42
2	Less than or equal to 5 acre	53
3	More than 5 acre and less than 10 acre	47
4	Greater than 10 acre	8

Source: Researcher's own computation from primary data

Irrigation sources

Most of the area is cultivated as rained. The water requirement for the cotton crop is also low and cultivated in kharif season so the irrigation is mostly fulfilled by the rainfall. Open wells and bore wells are the important source of irrigations. Maximum number of farmers have given their response as the irrigation sources as given below,

Figure 5: Irrigation source available in study area (n=150)



Source: Researcher's own computation from primary data

Time of sowing

Time of sowing is majorly in the June and first forth night of July. In the July month sowing is done as late sowing and gap filling. The recorded time of sowing of respondents are

Table 5: Time of sowing of cotton by farmers

June 1 st week	32
June 2 nd week	44
June 3 rd week	54
June 4 th week	20

Source: Researcher's own computation from primary data

Seed rate

The farmers perform two types of planting, one with the high density utilising around 2 packets of BT cotton seeds. Each Bt cotton seed packet comprises of 450 grams of seeds. In the low frequency and inter cropping system about one packet of seeds are used per acre. The soils in this region are mostly black cotton and red soils.

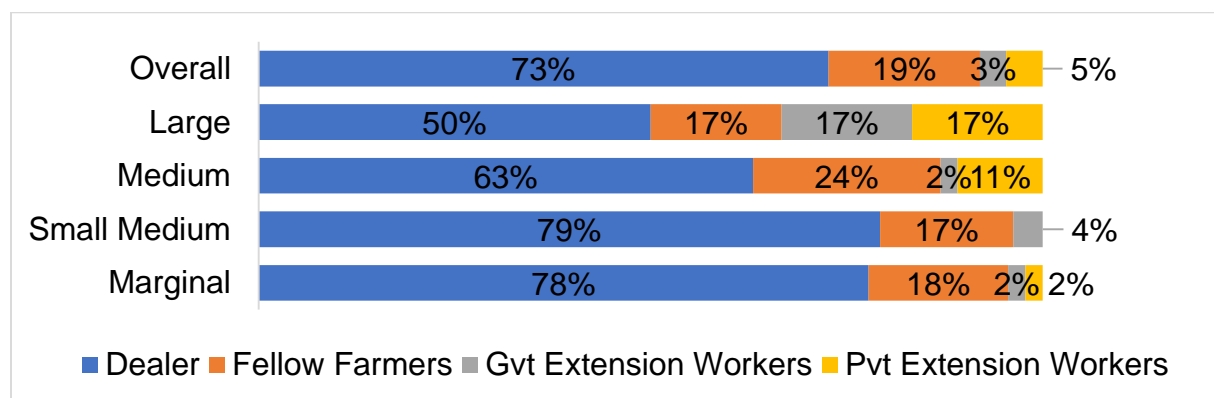
Harvesting

On an average respondents complete the harvesting in maximum of three pickings. But due to the high outbreak of pests in the flowering and fruiting stage the yield is lowered. The average yield of the respondents is of 7.23 quintals of lint per acre. The yield of cotton is declining from past two years due to the high pest attack on the crop.

Plant protection consultation

Figure 6: Plant Protection consultation by farmers

(n=150)



Source: Researcher's own computation from primary data

Farmers in the deep rural area are still dependent on the recommendation of the chemicals by the dealers itself. In the extreme rural markets, here transactions are done as credit basis, so farmers approach for the product if that product isn't available then farmer is referred with chemicals by the dealers. Although product quality and effectiveness are strictly considered.

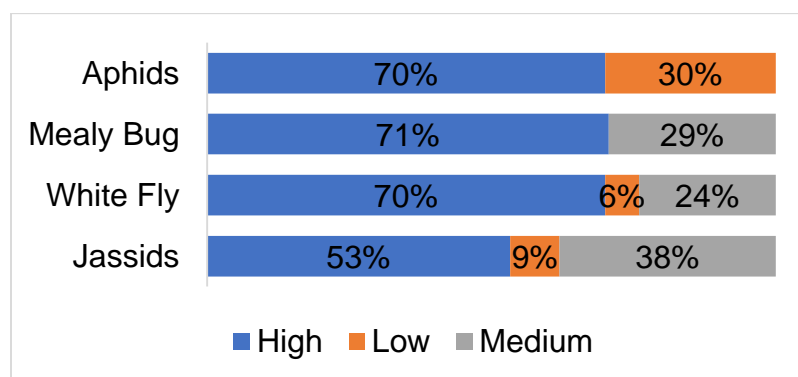
With government penetration through extension services, they are able to reach progressive young farmers and providing their assistance in knowledge. Suggestion from the fellow farmers give the farmer top of mind awareness about the effective control by the chemical application of fellow farmer, then the farmer's decision can be impacted.

Average cost for control of sucking pest chemicals is about 1500 rupees, the buying behaviour of the farmer is altered with various attribute related to the pest control and chemical impact on pest.

Major pests and their severity

According to the response given by farmers the attack of aphids is mostly from the starting stage of the crop from the third fourth week of the crop. Severity of tobacco caterpillar attack is more early and intense in the target area. White fly infestation has been increase in recent years and the pest is mostly observed in cotton crop after 40 days of sowing. This is one of the major pest causing more severe damage to the crop and also increasing cost of cultivation with more number of chemicals spraying to control this pest. Appearance of Aphids and Jassid in cotton crops is reported my most of the farmers after 15-20 days of sowing. Control of these pests in different stages of the crop has increasing number of chemical application in total crop cycle.

Figure 7: Sucking pest severity in cotton by farmers (n=150)



Source: Researcher's own computation from primary data

4.2 To Study The Market Potential of insecticides for Sucking Pest Segment (Jassid, Aphid, Whitefly, Bollworms and Mealy bug)

Total cotton crop acreage of Khammam and Warangal district of Telangana state is about 10.21 Lakh acres. 6.62 lakh acres in Warangal district and 3.59 lakh acres in Khammam district of Telangana. There is slight decrease in area under cotton cultivation due to availability of ground water in recent years and increase in support price for crop produce of paddy, turmeric and chilli. Both the states are also major producers of paddy in Kharif season. There several other abiotic factors effecting the area under cotton cultivation in Telangana region. Of these challenges farmers are facing availability of one the factors where the farmers are opting less labour involved crops like paddy, maize, pulses and turmeric.

Based on the responses given by the farmers we have identified few of the chemicals which are mostly used for control of sucking pests in cotton crop are Imidacloprid, Acephate, Flonicamid and Monocrotophos. Below show table has market potential of major chemicals sold in cotton market in Warangal and Khammam district.

Total market potential of insecticides is the maximum consumption of chemical for treating cotton sucking pests in study area.

Market potential (Volume) = Project acreage of cotton in study area (Acre) × Recommended dosage of chemical per acre

In Table 6, only single application of insecticide for control of sucking pests is considered. The market potential in this study is calculated in terms of volume for each district separately. Average application of insecticide per acre is taken from recommendation of chemical by the product manufacturers.

Table 6. Market potential of major cotton sucking pest segment insecticides in Warangal and Khammam (In terms of quantity)

	Dosage (Litre/ Kg per acre)	Market Potential in Warangal (Tonnes/ Kilo Litre)	Market Potential in Khammam (Tonnes/ Kilo Litre)
Imidacloprid 17.8 SL	0.1	66.2	35.9
Flonicamid 50% WG	0.06	39.7	21.5
Monocrotophos 36% SL	1	662.4	359.1
Acephate	0.4	264.9	143.6

Source: Researcher’s own computation from primary data

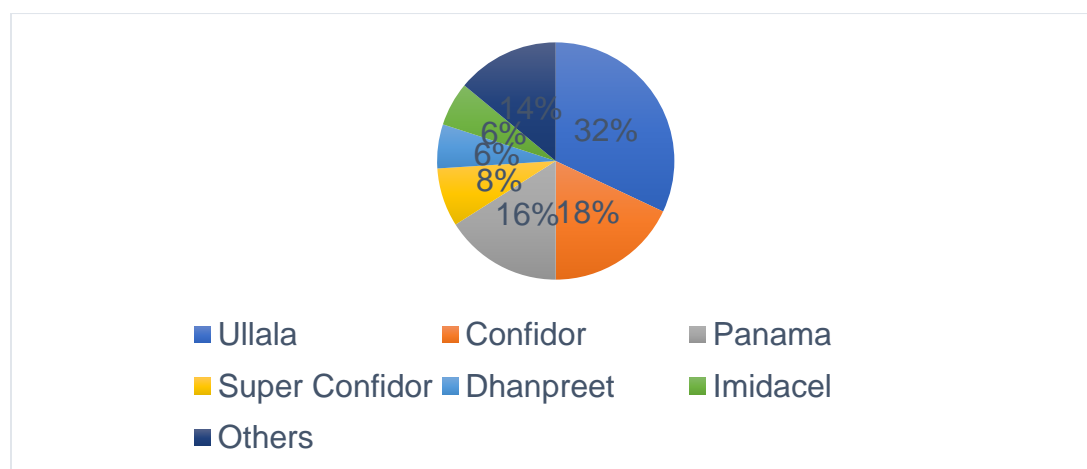
4.3 Competitive molecules in cotton insecticides

Aphids

The major competitor products in the aphid insecticide segment is Bayer super Confidor, SWAL panama and UPL Ullala. This information was collected from dealers and distributors in study area to know major molecules used for sucking pests in study area. These are broad spectrum insecticides. These products are very much known by the farmers because of their results and control effectiveness. These products are sold mostly by the farmer preference and as mark of product quality.

Figure 8: Major molecules for control of Aphids

(n=50)



Source: Researcher’s own computation from primary data

Most of the brand sold for control of aphids in cotton are recommended by retailers. Ullala, Confidor and Super confidor are of same technical but because of effectiveness and awareness level of brands among farmers.

Table 5: Top 3 Brands for control of Aphids

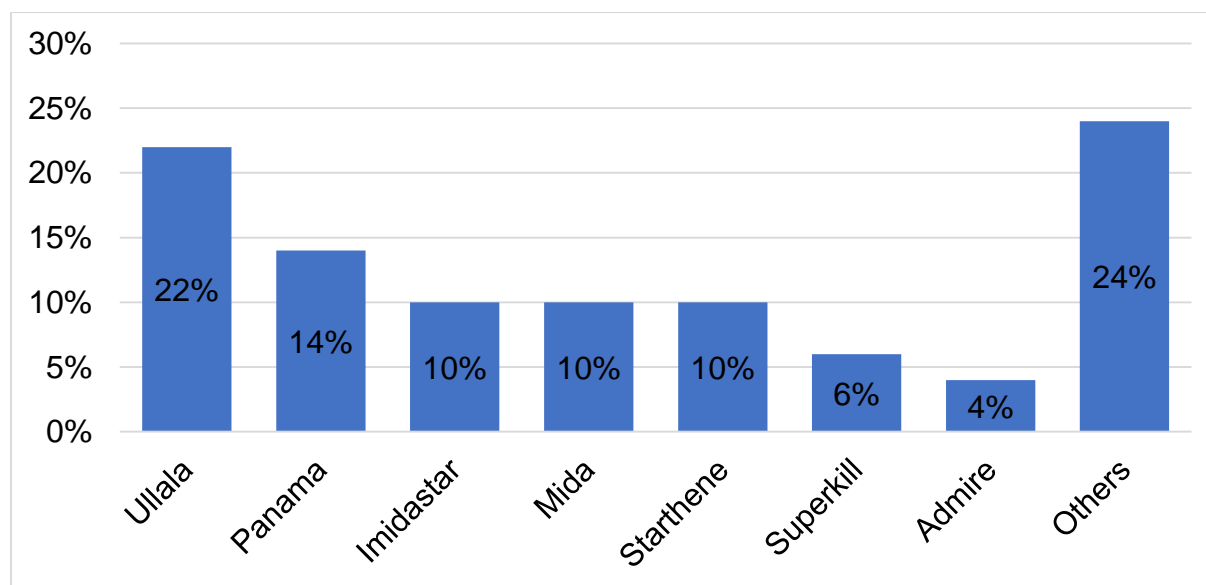
Sr. no.	Brand	Company	Technical
1	Ullala	UPL	Flonicamid 50% WG
2	Confidor	Bayer	Imidacloprid 200SL
3	Super confidor	Bayer India ltd.	Imidacloprid 350 SC (30.5%w/w)

Source: Primary data

Jassids

Jassids are major problem for cotton farmers in the initial stage of the crop. It can be easily controlled by insecticide application. There is no dedicated spray in done by farmers in study area for control of jassids

Figure 9: Major molecules for control of Jassids (n=50)



Source: Researcher's own computation from primary data

From figure 9, broad spectrum insecticide Ullala and Panama has dominant in the jassids segment for the control. These products are the special premium products of different

companies. The ease of use of the product has encouraged the growth of the sales. Along with this Mida produced by Nagarjuna company is also the dominant due to its price and the brand perception.

Table 8: Top 3 Brands for control of Aphids

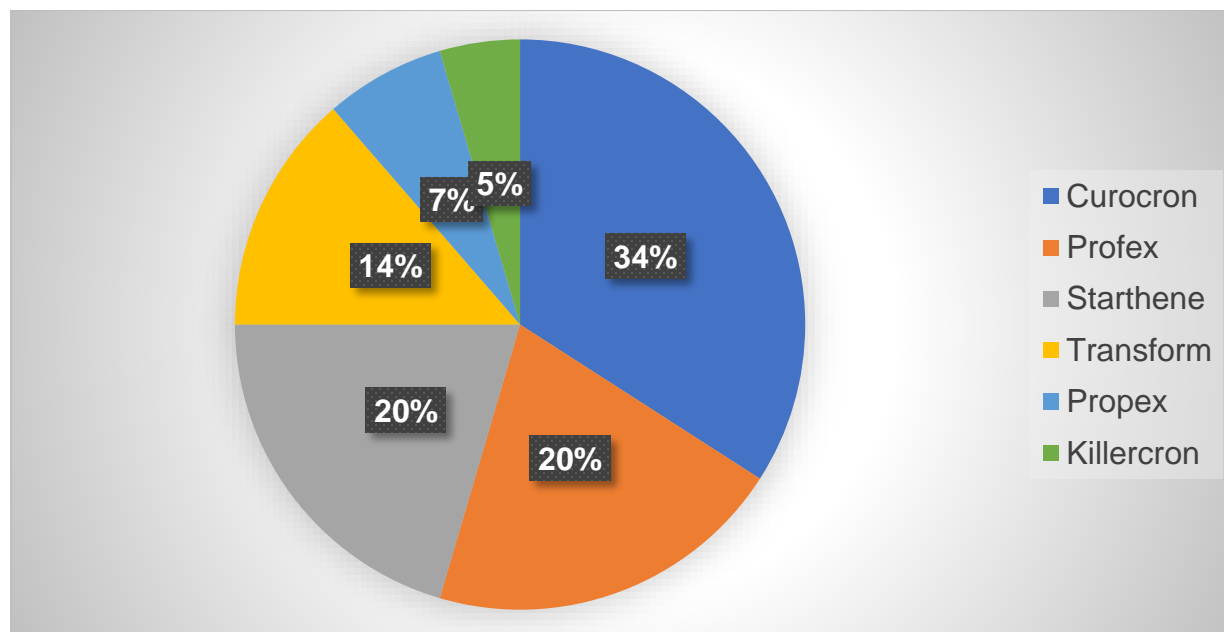
Sr. No.	Brand	Company	Technical
1	Ulala	UPL	Flonicamid 50% WG
2	Panama	SWAL	Flonicamid 50% WG
3	Imidastar	SWAL	Imidachloprid17.8%SL

Source- Researcher's own computation from primary data

Mealy Bug

In mealy bug segment the most concentrated competitor products are Curocron of Syngenta, Profex of Nagarjuna limited and Starthene of the SWAL Company. Insecticides specific to mealy bug control are only recommended when the infestation level is high.

Figure 10: Major molecules for control of Mealy Bug (n=50)



Source: Researcher's own computation from primary data

Insecticides used for control of aphids and Jassid in initial stage of crop will provide control over mealy bugs in cotton. Mostly Prophenophos technical is recommended by

dealers/distributors for farmers to control mealy bug.

Table 9: Top 3 Brands for control of Mealy Bug

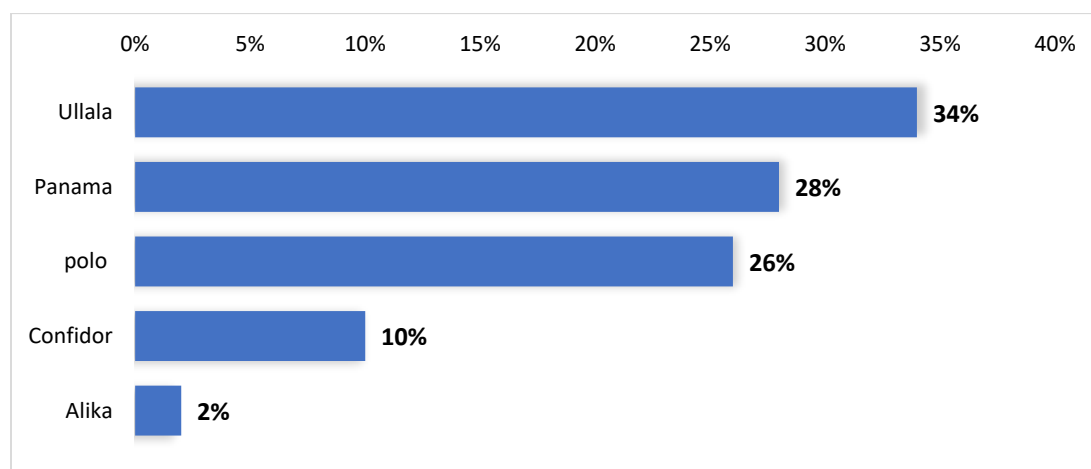
	Brand	Company	Technical
1	Curocron	Syngenta	Prophenophos50% EC
2	Profex	Nagarjuna	Prophenophos50% EC
3	Starthene	SWAL	Acephate 75%SP

Source: Researcher’s own computation from primary data

White Fly

The best selling insecticides of cotton crop are mainly of Bayer, Syngenta, SWAL, Nagarjuna and Dov crop protection limited. The factor mainly stressing of the sale of the product is the quality and pest control, force from the farmer after their their previous experience.

Figure 11: Major molecules for control of White Fly (n=50)



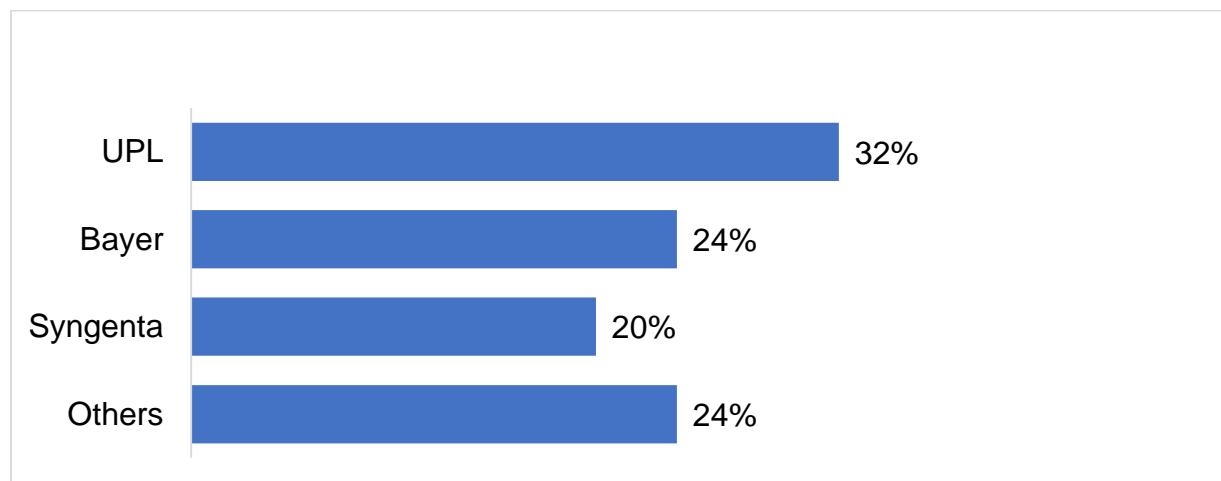
Source: Researcher’s own computation from primary data

Major Competitor in sucking pest insecticide segment

Dealers/distributors are point of connection between the company and farmer. These farmers taken crop protection recommendations from his dealers/distributors most of the time. TOMA of product by dealers/distributors is very important, if awarensss level of the product is high among dealers/distributors then it will help in product push or sale at

pesticide outlet. TOMA of UPL is highest, folloed by Bayer and Syngenta for control of sucking pests segment in cotton crop.

Figure 12: TOM awareness of companies by dealers/distributors (n=50)



Source: Researcher's own computation from primary data

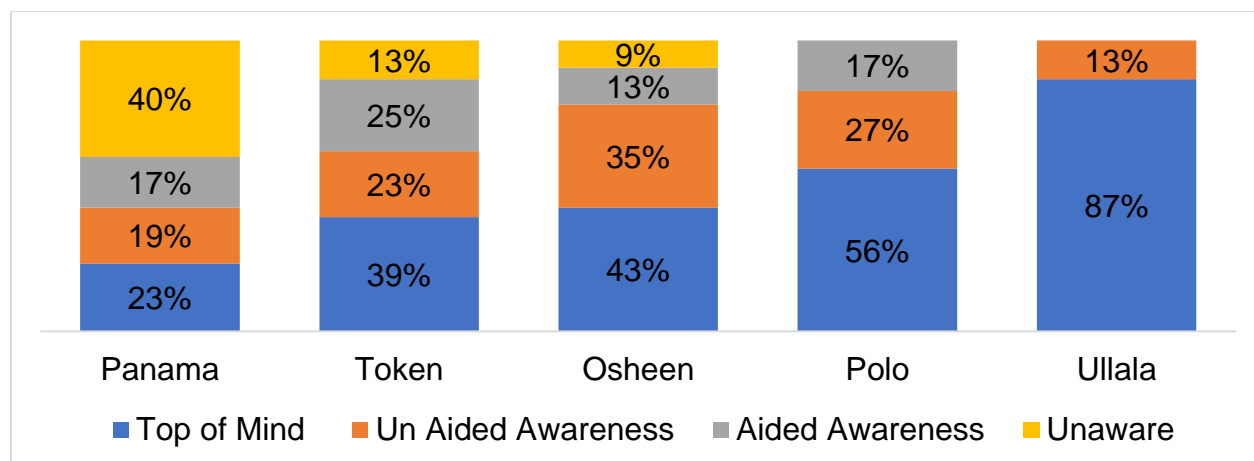
Brand awareness

Major Cotton insecticides in cotton market are taken as reference to identify the awareness of the products among farmers.

For recording brand awareness among farmers for control of sucking pests, top of mind awareness, aided awareness, unaided awareness and unaware. Top of mind awareness is the brand name mentioned by the farmer after asking about sucking pest controlling products. Unaided awareness is considered when farmer mentions product without any assistance or prompting. Aided awareness is considered when farmer recalls the product name with assistance or prompting (company name or product specifications). If farmers doesn't recall the product name even after prompting or assistance to identify product.

Ullala and panama brands are extensively known by the farmers by their strong publicity through various promotional activities and the product brand and quality. These chemicals have created the perception in the farmer minds as an effective pest controller. Movento and sivanto are having low top of mind awareness, aided and unaided awareness.

Figure 13: Farmers' awareness of major insecticide brands (n=150)

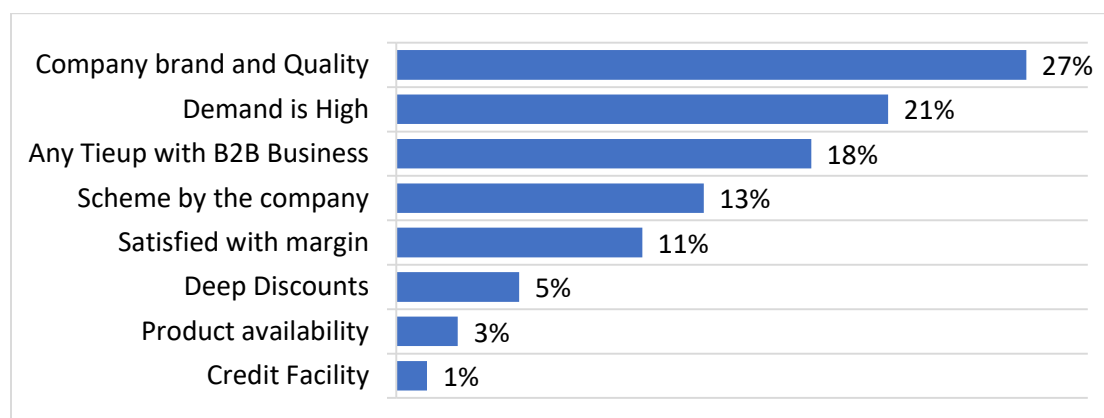


Source: Researcher's own computation from primary data

4.4 Farmers' and dealers expectations from insecticides

Dealers/distributors's motivation for sale of a product for cotton sucking pest insecticide is based on the demand of the product, dealership or distribution ship of particular company, brand and quality of the product. Least preferred reason for sale of the product was product availability in the local market. According to dealer the farmers very rarely come to them asking about the product by seeing promotional activities. Farmers in study area mostly depend on the recommendations given by the dealers/ distributors.

Figure 14: Factors influencing selling of product by dealers/ distributors (n=50)



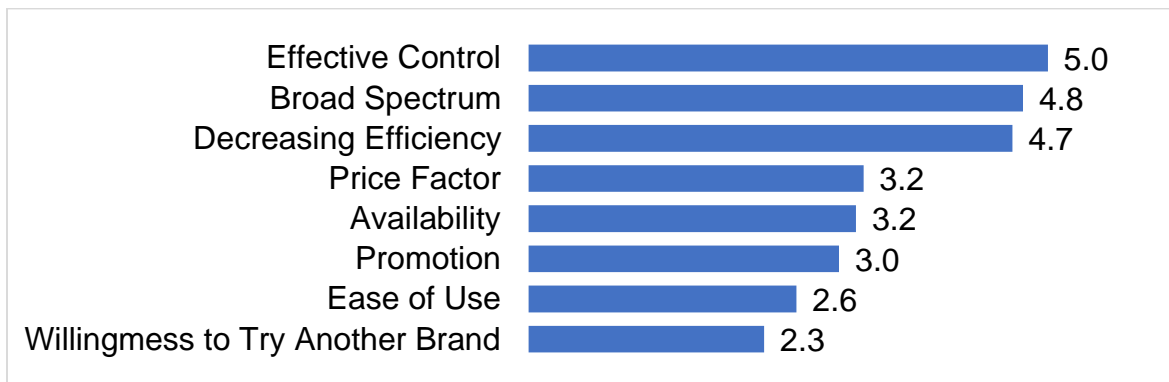
Source: Researcher's own computation from primary data

Factors influencing purchase of product by farmers

According to farmer, sucking pest like aphids, mealy bug and whitefly are quite severe. These pest infestation has impact on the growth of the cotton crop. Impact of the tobacco caterpillar and pink boll worm are so high after the flowering stage. These attacks are

more severe from the past few seasons, resulting in the decline in the yield and farmer preference of cotton crop cultivation.

Figure 15: Agrochemical attribute preferred by farmer for purchasing (n=150)

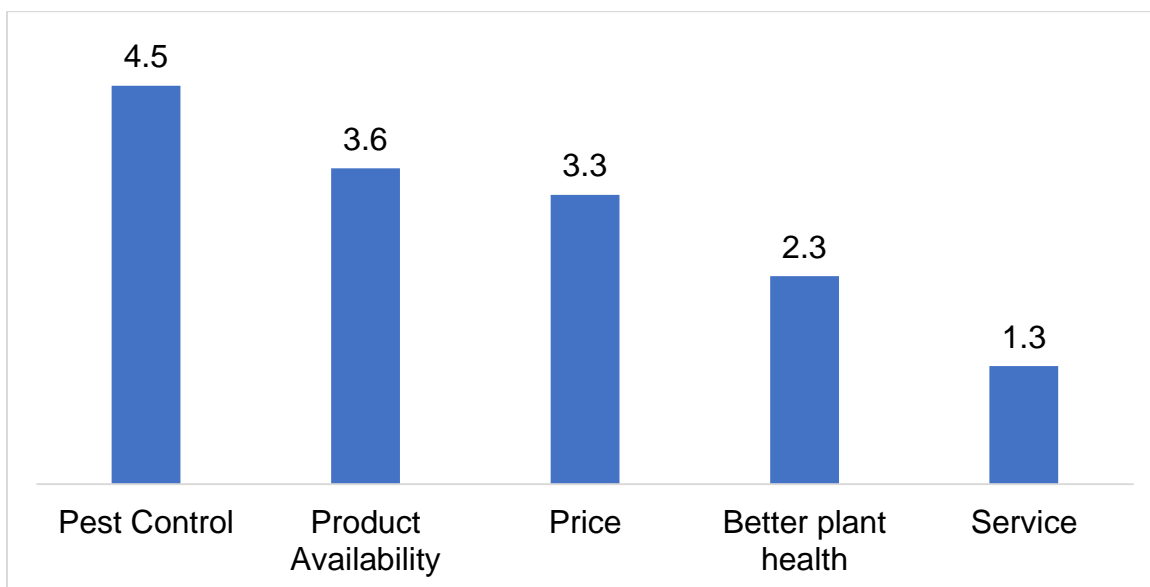


Source: Researcher's own computation from primary data

Reason for the shift for the product brand is mainly due to the ineffective control, broad spectrum and effective control. Want to use a new brand is very low due to insecurity of the inefficiency of new brand. Price is the secondary concern than the quality of the product for the farmers.

Factors considered by farmer for buying an Insecticide

Figure 16: Factors considered for buying insecticide by farmer (n=150)



Source: Researcher's own computation from primary data

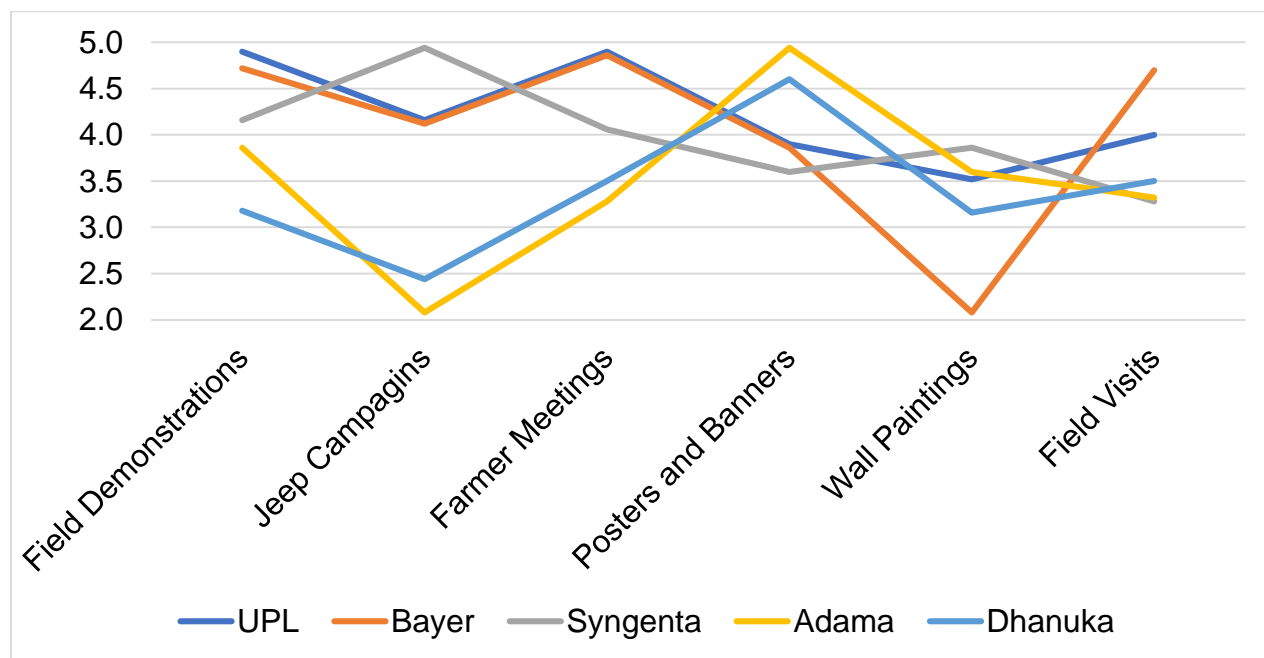
Major factors considered by farmers for buying an insecticide in cotton for pest control is

pest control capacity of the insecticide followed by product availability and price. Least considered factor is the service provided by the company. As farmer are more interested in availing immediate benefits before buying.

4.5 To study different promotional activities of major players in the market survey competitive molecules

For fulfilling this objective data is collected from dealers/ distributors of study area. Rating were collected from dealers/ distributors based on their satisfaction towards promotional activities performed in study area. From the figure 17, the study area dealers/ distributors interest towards sale of the product dependent on the activities and services provided by company. Performance of product is directly influence the sale of the product. Adama Company has highest rating given by dealers/distributors for their promotional activity of posters and banners. Bayer and UPL are strong in their farmer meeting, dealers/distributors have given highest rating by dealers/distributors for their impact of promotional activities in market. Syngenta has given highest rating by dealers/distributors for their promotional activities of jeep campaign and wall painting in study area.

Figure 17: Promotional Activity Rating by dealers/distributors (n=50)



Source: Researcher's own computation from primary data

5. Conclusions

- For the sale of a particular brand of insecticides dealers, retailers and distributors it depends on the business tie up with business-to business partnership, brand and quality and high demand of the particular product.
- The major competitors in the cotton insecticides segment are Bayer, Syngenta, UPL and SWAL due to the product quality and effectiveness of the promotional activities.
- The dealers and distributors preferred the product quality, demonstrations and farmer's preference as a parameters for the sale of the product in the market.
- Dealers prefer the product push from the farmers' side for the establishment of reliability on the company's product, but the farmer are dependent on the dealer's suggestion for the purchase of the insecticides.
- Dealers believe in the promotional activities like field support, demonstration and product quality alongside with the margin for the dealers for the increase of the brand sale in the market. Media and literacy are preferred by the dealers
- Farmers in the target area are due to the use of the land taken on lease, they rely on the dealer's decision for the pest control.
- In case of the credit purchase of the product they don't stress on the product and its availability, but for farmers with the cash purchase the farmer have choice of the particular product.
- Farm holdings are very small and the irrigation source is mainly through tube wells and bore wells. Cotton cultivation is mainly through the rain fed.
- Ease of use and product price is low preferred reason for the shift of the brand. Farmers' main reason for the reasons of buying a product is ineffective control, broad spectrum and decreasing efficiency.
- Farmer also proffer the field demonstration as promotional toll to know the product effectiveness and promotion of the product can be placed in the mind of farmer.
- The main factor seen for the purchase of the product are pest control, product availability and price, and least ranking is seen for services.

6. Bibliography

- Chandel, R. S., Banyal, D. K., Singh, B. P., Malik, K., & Lakra, B. S. (2010). Integrated management of whitefly, *Bemisia tabaci* (Gennadius) and potato apical leaf curl virus in India. *Potato research*, 53(2), 129-139.
- Dhillon, M. K., Gujar, G. T., & Kalia, V. (2011). Impact of Bt cotton on insect biodiversity in cotton ecosystem in India. *Pak. Entomol*, 33(2), 161-165.
- Kranthi, K. R., & Stone, G. D. (2020). Long-term impacts of Bt cotton in India. *Nature plants*, 6(3), 188-196.
- Mahalakshmi, M. S., & Prasad, N. V. V. S. D. (2018). Influence of spacing on incidence of major insect pests in rainfed cotton. *Journal of Research ANGRAU*, 46(2), 58-66.
- Mani, M. (2010). Origin, introduction, distribution and management of the invasive spiralling whitefly *Aleurodicus dispersus* Russell in India. *Karnataka Journal of Agricultural Sciences*, 23(1), 59-75.
- Meghana, H., Jagginavar, S. B., & Sunitha, N. D. (2018). Population dynamics of sucking insect pest complex on intra-specific and inter-specific Bt cotton under rainfed situation. *J. Entomol. Zool. Stud*, 6(3), 466-471.
- Monga, D., Chakrabarty, P. K., & Kranthi, K. R. (2011). Cotton leaf curl virus disease in India-Recent status and management strategies. In *Fifth meeting of Asian cotton research and development network, Lahore* (pp. 23-25).
- Morse, S., Bennett, R., & Ismael, Y. (2007). Isolating the 'farmer' effect as a component of the advantage of growing genetically modified varieties in developing countries: a Bt cotton case study from Jalgaon, India. *The Journal of Agricultural Science*, 145(5), 491-500.
- Pandagale, A. D., Baig, K. S., Telang, S. M., Dhoke, P. K., Rathod, S. S., & Namde, T. B. (2020). Influence of high density planting and genotypes on major pests and diseases in rainfed cotton. *J Environ Zool Stud*, 8, 1916-1920
- Prasad, N. V. V. S. D., Rao, M., & Rao, N. H. (2009). Performance of Bt cotton and non Bt cotton hybrids against pest complex under unprotected conditions. *Journal of Biopesticides*, 2(1), 107-110.
- Ramanjaneyulu, A. V., Giri, G., & Kumar, S. R. (2010). Biofertilizers, nitrogen and phosphorus on yield and nutrient economy in forage sorghum affected by nutrient management in preceding mustard. *Biores. Manag*, 1(66.68), 20.

Rani, B. S., Prasad, N. V. V. S. D., Rao, P., & Rao, V. S. (2010). Performance of insecticides and transgenic Bt cotton for the management of pink bollworm, *Pectinophora gossypiella* (Saunders) in cotton. *Journal of Entomological Research*, 34(2), 125-129.

Rathee, M., & Dalal, P. (2018). Emerging insect pests in Indian agriculture. *Indian Journal of Entomology*, 80(2), 267-281.

Sharma, H. C., & Pampapathy, G. (2006). Influence of transgenic cotton on the relative abundance and damage by target and non-target insect pests under different protection regimes in India. *Crop Protection*, 25(8), 800-813.

Sridharan, S., Saravanan, P.A., & Manoharan, T. (2016). Biointensive Pest Management of Spiralling Whitefly in Tapoica. *Ecological perspectives*, 721.

Web Sources

Area, yield of cotton across different countries from 2015-16 to 2017 retrieved from <https://cotcorp.org.in/statistics.aspx> on 1st March 2019

Top 10 States in Cotton production in India (2015-16) retrieved from <http://www.mospi.gov.in> on 18th January 2018

Area and average yield of Cotton crop retrieved from https://cotcorp.org.in/national_cotton.aspx on

Percentage of area under cotton cultivation across different states retrieved from <http://cicr.org.in/database/dbcapp5.html> on 12th January 2020

State wise area under Cotton crop from 2014-15 to 2017-18 (In Lakh ha) retrieved from <http://cicr.org.in/database/dbcapp5.html> on 12th January 2020

(Ganji Sai Reddy)

Appendix-1

Survey of Farmers – Sucking Pest Control

1. General Information:

Name of respondent: _____ Father's name: _____

Age:

A. 20- 30		B. 30- 50		C. 50 above	
--------------	--	--------------	--	----------------	--

Village: _____ Taluk: _____

District: _____ Contact No.: _____

2. How much land holding you have _____ (In acres) For Cotton _____

3. Irrigation source for cotton cultivation:

- A. Canal
- B. Tanks
- C. Tube well
- 4. Others

4. You are cultivating your crop under:

- A. Irrigated
- B. Rain fed

5. Type of soils

- a. Alluvial
- b. Black cotton
- c. red Soils
- d. Laterite soils

6. Time of sowing: _____

7. Seed rate per acre (per Kg) _____

8. You are doing any gap filling and thinning operations _____

9. How much qty of fertilizer you are using for complete crop period

- a. N: P:K Ratio: _____
- b. FYM _____
- c. Micro nutrient

9. How many irrigations you are giving entire crop period

a.1-5 b.6-10 c.11-15 d. based on soil condition

10. Harvesting done in how many pickings:_____

11. How much yield you are getting per acre of land

- a. Irrigated
- b. Rain Fed
- c. Hybrid

12. What type of seeds you are using for cultivation

- a. varieties b. Hybrids c. Bt- Varieties

13. Which varieties of cotton u r cultivating :

- 1. 2.
- 3. 4.

14: How do you know about crop protection chemicals?

- a. Dealers b. Govt. extension workers c. Pvt. Extension workers d. Print media
- e. Fellow farmers

15. How much money you are spending for spraying one acre of land :_____ (per single spray of land)

16. BRAND AWARENESS

Now, please look at this list of Insecticide brands and tell me which of these brands are you **aware** of?

Exclude brands stated in

	Q2a	Q2b	Q2c
	TOM	Unaided Awareness	Aided awareness
Panama	1	1	1
Ulala	2	2	2
Token	3	3	3

Osheen	4	4	4
Movento + Sivanto	5	5	5

17. What are the major pain point of a cotton farmer?

S. No.	Name of pest	Appearing time (Days)	Severity of pest (Low-Medium-High)	Remarks

18. Spray Schedule followed by cotton farmer:

No of sprays	Technical	Brand Name	Control	Price In INR

19. REASONS FOR SWITCHING TO OTHER PRODUCTS (score-1 to 5):

S.No.	Reasons	1-Least	2-Low	3-Moderate	4-High	5-Very High
1.	Ineffective control					
2.	Decreasing efficiency over years					
3.	Broad spectrum					
4.	Availability					
5.	Promotional activities					

6.	Ease of use					
7.	Price factor					
8.	Wanted to try another brand					

20. Rank the following particular (5-Highly satisfied --- 1- highly unsatisfied)

S No	Particular	Rank
1	Price	
2	Better plan health	
3	Pest control	
4	Product availability	
5	Service	

21. Major 3 chemicals used for control of sucking pests-

TOM-

Spont 1

Spont 2

22. Did you see any company's promotional Activities

a. Yes

b. No

23. What are the Companies whose promotions are seen?

Company 1	
Company 2	
Company 3	

24. What are Promotional Activities you have seen or visited:

Banners	Posters	Jeep Campaign	Demonstrations	Farmer Meeting	Wall Painting

Appendix-2

Survey of Dealers/ Retailers

1. General Information:

Name of the Shop: _____

Respondent Name: _____

Age: _____

Education: _____

Contact Number _____

Turnover: _____

Village: _____

Tehsil Name: _____

District: _____

2. Best-selling insecticide brand (Specifically JAM) in cotton crop:

Brand	Company	Target pest	Price	Dose	Packaging	Benefits (A-L)
A. Demand is high			G. Promotion			
B. Satisfied with margin			H. Any Institutional linkage			
C. Scheme by the company			I. Any tie-up with B2B business			
D. Product availability			J. Credit facility			
E. Company brand and Quality			K. Deep Discount			
F. Packaging/SKU			L. Incentive			

4. Best-Selling insecticide brand (Specifically JAM)

Brand	Volume (ltr)	Value(INR)	Margin per unit

5. Pest wise opportunities:

Pest	Products names	Nos of spray	Premium Molecules (nos of spray)	Generics
Jassids				
Aphids				
Mealy bugs				
Mites				
Pink Bollworm				
Thrips				
White fly				

6. Effectiveness of Media:

Rank (1high-6Low)	Parameter	Freq. (A-D)	1	2	3	4	5
	Jeep Campaigning						
	Literature						
	Field Support						
	Non-verbal (SMS, TV)						
	Farmer Meeting						
	Demo						
	Any Other						

***Frequency/year=A. Once B. Twice C. Thrice D. >3*

7 .Is there any product available for JAM (broad spectrum);

8. Please give rating for following promotional activities

Promotional activity	Rate out of 10
Big launch	
Margin	
Field support	
Promotional activities	
Demonstrations	
Product Quality	
Price	
Farmer preference	

9. Promotional activity ratings

S.No.	Reasons	UPL	Bayer	Syngenta	Adama	Dhanuka
1.	Field Demonstrations					
2.	Jeep Campagins					
3.	Farmer Meetings					
4.	Posters and Banners					
5.	Wall Paintings					

10. What is your expectation if a company launch new product in JAM segment?

11: Any suggestions: