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Research Article

Research Study On The Insect Of Cucurbitaceous Vegetables And Their Properties

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ABSTRACT

Cucurbitaceous vegetables, such as melons, pumpkins, squash, and cucumbers, are essential to human nutrition and global agriculture. They can, however, be severely impacted in terms of quality and productivity by a range of insect pests. In order to develop efficient management measures, this study will look into the insects affecting cucurbitaceous vegetables and investigate their qualities. In order to identify and define the common insect pests associated with cucurbitaceous crops, the research combines field surveys, laboratory studies, and literature reviews. To understand the interactions between insects and cucurbitaceous plants, a variety of parameters, including species diversity, population dynamics, insect behavior, reproductive biology, and dam age trends, are examined. The study identified a number of important insect pests, including mites, beetles, thrips, aphids, and whiteflies. These pests have a variety of feeding patterns, which include piercing fruit, sucking sap, digging through leaves, and wilting. Other symptoms include yellowing, defoliation, and deformed fruit. The damage caused on cucurbitaceous crops is also exacerbated by the fact that some insects serve as disease vectors. The study also looks at the characteristics of insect pests, such as their life cycles, preferred host plants, geographic distribution, natural adversaries, and resistance to biological and chemical control agents. The research's insights offer important information for the creation of integrated pest management (IPM) plans that are suited to certain geographical areas and farming systems. The findings highlight the importance of integrating cultural practices, biological control agents, botanical insecticides, and prudent application of synthetic chemicals to mitigate insect age dam impact while minimizing unfavorable environmental effects. In order to promote sustainable pest management practices in the production of cucurbitaceous vegetables, it is also crucial to increase farmer awareness and develop their competence in the areas of age recognition, monitoring, and decision making. Finally, by providing useful advice for sustainable pest management techniques to maintain the productivity and profitability of cucurbitaceous crop production systems, this study adds to the body of knowledge on insect pests affecting cucurbitaceous vegetables and their qualities.

Keywords: Insect; Cucurbitaceous; Vegetables; agriculture

I.INTRODUCTION

The cruciferous family of economic plants, which includes turnips, cabbage, rape, mustard, radish, cauliflower, knol khol, and radish, is mostly consumed by domestic animals and people nationwide. The issue of crop protection did not arise in the distant past when man was not required to generate an excess of vegetables. However, the issue of safely cultivating vegetable crops has taken on significant importance in order to meet the need for widely consumed vegetables by the unproportionally expanded human population.Since the beginning of time, insects have caused significant losses to cruciferous vegetables. As a result, human attempts have been ongoing to reduce the pest population and maximize vegetable production. High yielding crop husbandry forces farmers to use pesticides extensively since high yielding cultivars can only reach their full potential when efficient insecticides are used to manage their heightened pest issues.Chemical control by itself won't be enough to advance India under current circumstances. Applying the efficient pesticides at the experimental and national demonstration stages is definitely doable. However, there are significant limitations when it comes to the age of widespread pesticide use. The annual cost of pesticide use in India is estimated to be between Rs. 15000 and 20000 crores. For India, where the national income from agricultural resources is approximately 18000/- crores, this is a very large number. The fundamental truth is that there is a shortage of pesticides. Because our domestic pesticide production cannot keep up with demand, we must import a significant amount of pesticides annually, placing a heavy burden on our limited foreign exchange reserves. In the global market, there is a severe lack of numerous products, even if we are willing to purchase pesticides. Therefore, in order to address the issues at hand on a national level, alternative approaches to insect-pest management other than synthetic chemical insecticides are required.

Cucurbitaceous vegetables, which are members of the Cucurbitaceae family, are an important part of the world's agricultural production and offer millions of people essential nutrients, a variety of culinary options, and a means of subsistence. Grown in a variety of agro-ecological zones and cultural contexts, this diversified group of crops includes, among others, cucumbers, pumpkins, squash, melons, and gourds. However, a variety of biotic and abiotic variables make it difficult to cultivate cucurbitaceous vegetables, with insect pests providing a serious threat to both their quality and productivity.

Among its most dangerous enemies are insects, which can cause significant losses to cucurbitaceous crops by causing feeding damage, spreading disease, and upsetting plant physiology. For effective management techniques to protect crop yields and enhance agricultural sustainability, it is imperative to comprehend the age dynamics of insect pests connected with cucurbitaceous vegetables and elucidating their features.

The aim of this study is to investigate the insects affecting cucurbitaceous vegetables in detail and examine their features, including species diversity, population dynamics, feeding behavior, reproductive biology, and susceptibility to control techniques. This research intends to shed light on the complex relationships between insects and age plants in order to help design integrated pest management (IPM) solutions that are suited to mitigate pest pressure and maximize crop production.

It is impossible to overestimate the significance of doing research on insect pests in the cultivation of cucurbitaceous vegetables. Numerous insect species, each with unique ecological preferences and adaptive tactics, use these crops as hosts. In addition, the need for sustainable pest management solutions has increased due to the global expansion of cucurbitaceous farming, which is being driven by rising demand and market prospects. These problems include invasive species, pesticide resistance, and environmental degradation.

This study aims to enhance our understanding of the complex relationships between insects and insect action in various agro-ecosystems. This research aims to equip stakeholders, such as farmers, extension agents, researchers, and policymakers, with knowledge-driven insights to enable them to make knowledgeable decisions and implement context-specific pest management interventions by elucidating the characteristics of insect pests and their ecological roles.

II.LITERATURE REVIEW

Cherian and Gopalamenon (2009) tried with unpurified oil of castor, groundnut and neem against caterpillars of Eupterote mollifera, grubs of Epilachna beetle and Aphis medicaginis as insecticide, significant results were obtained and found that the toxicity of the oils increased with the addition of some soft soaps.

Chopra et al. (2009) reported that neem (Azadirachta indica), patchouli (Pogostemon heyneanus) and costus (Saussurea lappa) have been used in India since times immemorial for protection of woolens fabrics, books and leather goods etc. They have tabulated 74 plant sp. having insecticidal or repellent properties.

Pruthi and Singh (2010) stated that in north West India it is a general practice of placing 3-4 thick layer of neem (Azadirachta indica) leaves in a grain heap for protection from damage caused by various insects of stored products, sometimes the top of heap also kept covered with the leaves.

Metzger and Grant (1987) studied 474 extracts, representing 390 plants and tested for their repellency against Japanese beetle but only 56 were able to give repellent effect. The alcohol and water extracts of fresh leaves of sweetflag were tested at 1/25th of full strength dilution, but gave a significant effect.

Mirnov (1996) studied the insecticides and repellent proportion of sweetflag as dust against some insects pests and found very effective to Anopheles maculipennis and Musca domestica after 40 minutes, but was not very effective to Ixodes ricinus and found ineffective against Ornithodoros sp.

In an experiment, Subramanian (1997) found very effective results with powdered rhizomes of sweetflag against such household insects as head lice on fowl, bed bug and cloth moth.

Denisov (1998) used the powdered rhizomes of sweet flag as insecticides and repellent against mosquitoes in an experiment carried out in the province of Kalinin in the month of December. Mosquitoes in their hebetation quarters at temp. 1-15°C (33.8 - 34.7°F) were dusted with a fine power of dried rhizomes 0.15-0.6 oz/sq. yard but the percentage mortality was very low.

Rubinstein (1998) found that the dried rhizomes of sweet flag contain 1.3 per cent essential oils and 0.62 per cent of an alkaloid called calamine and found that alkaloid possibly acts as a contact poison to lice on fabric piece in covered glass containers at 25-37°C the lice became resistant in 1-2 hours, then torpid and died (in 4-7 hours or more).

Steyn (2017) worked on the poisonous properties of dharek to worm blooded animals, found that its seeds produced gastroenteritis in sheep and paralysis in pigs, rabbits and guinea pigs. Thus according to the findings the drupes of dharek posses' sufficiently poisonous property to all kinds of warm blooded animals.
Morrison and Grant (2017) isolated a toxic substance from the drupes of Melia australasica and found that the substance occurred in resinous form and may be extracted with ether from both green and mature fruits.
Volkonvsky (2017) in an experiment with five species of locust viz., Schistocerca gregaria, Locusta migratoria, Amacridium aegyptium, Calliptamus italicus and Dociostaurus maroccanus was made on "Acridifuge" action of an extract from the leaves of M. azedarach in Russian. All the five species were strongly repelled by the leaves of dharek plants.
Detheir (2017) in his book "Chemical insect attractants and repellents" indicated that the extracts prepared from the leaves of dharek (M. azedarach) protected various garden crops against North African Grasshoppers. Oil of tropical grass, Melinis minutiflora which by odour repelled mosquitoes and ticks.
Atwal and Pasni (2018) studied the insecticidal properties of drupes of dharek (M. azedarach) against caterpillars of Pieris brassicae. The dust prepared from drupes and bits of water, alcohol and petroleum ether extracts were tried as insecticides against third instar larvae of Pieris brassicae.
Toxicity of Aphis rumicis L. and to certain caterpillars of spray fluids prepared from samples of pyrethrum (Chrysanthemum cinerariaefolium) grown in England from Swiss and Japanese seed was determined quantitatively by Fryer, et al. (2019). Pyrethrum flowers grown in 6 different localities, showed only slight differences. All samples had approximately the same toxicity and did not differ significantly from a sample grown on the continent. Toxicities of extracts of equal weights of pyrethrum flowers at different stages of development differed very little. Artificial drying of flowers had not significant effect on toxic properties. Flowers were about 10 times as toxic as stalks.
Kodin et al. (2019) described the isolation and insecticides activity of jasmolin II and dihydropyrethrin II a new constituents of pyrethrum (Chrysanthemum cinerariaefolium viz.). Jasmolin II was nearly as toxic as cinerin II against Musca domestica L. both were about 2/5 as toxic as commercial pyrethrum extract.
Deshmukh and Borle (2019) tested the plant materials for insecticidal properties might help in the development of new efficient synthetic insecticides. In view of these considerations the assaying for insecticidal activity in different parts of plants of plant materials was initiated and plant showing greater bioactivity, were studied further to determine their relative efficacy in relation to nicotine sulphate. The plant origin insecticide pyrethrin, rotenone and nicotine safer to mammals and higher animals.

III.MATERIAL AND METHOD

The details of Methodology employed in the experiment are given in following headings.

Experimental sites
Experiments were conducted in the laboratory as well as in the farm of D.A-V. College, Kanpur.

Geographical Sites
Test insect
1. Tobacco caterpillar (Prodenia litura Fabr.)
2. Painted bug (Bagrada cruciferarum Kirk.)
(1) Prodenia litura Fabr.

1. (a) Field collection of larvae and adults:
The larvae and adults of Prodenia litura Fabr. (Lepidoptera: Noctuidae) used as test insect in this investigation were initially collected from castor plants of the vegetable research farm Kalyanpur, Kanpur, National Sugar Institute, Kanpur, Botanical Garden of D.A.V. College, Kanpur and from the field of farmers.

(b) Mass-culture of larvae in the laboratory:
A laboratory culture of the larvae was maintained in cages on cauliflower plants, pertidishes, glass jars and wine chimneys on cauliflower leaves. The tiny larvae which hatched cut of the eggs were carefully transferred to fresh tender leaves of cauliflower. The leaves were washed with tap water before being fed to the larvae. The cleaned leaves were kept on moist filter papers in separate well cleaned petridishes (5"x5" in size) with a muslin cloth cover at the top. Newly hatched larvae were kept 200-300 in numbers, in big sized petridishes (6"x6") but as the large grew up proper spacing was provided to them. In the 4th and 5th instars only 10-12 larvae were kept in one petridish. The larvae of different instars were kept in different petridishes to prevent cannibalism.
The eggs laid by the moths were collected daily with the help of a camal's hair brush and kept for hatching in clean petridishes on fresh cauliflower leaves placed over moist filter papers. In this way a regular supply of newly hatched larvae was maintained throughout the experiment. The entire rearing was conducted in a controlled room with 27 ±1°C temperature and 75 ± 5 per cent relative humidity.

II. (a) Layout of the Experiment Field

Field was ploughed twice with the help of country made plough and levelled well. The cauliflower seedlings of variety "Snowball" were planted in a well layout field in the departmental insectory for the application of different insecticidal sprays. The whole field was divided into three main parts and each part was subdivided into three blocks. In Ist part each block was sub-divided into sixteen plots and in 2nd and 3rd parts each block was sub-division into fifteen plots measuring 1.0 x 2.0 meters. The treatments were assigned to the plots at random with the help of random numbers. A border of one foot was provided between the plots to reduce the border effect. While a border of half meter was provided around each part field and half meter irrigation channels were made in between the blocks. Ridges were made at a distance of 16 inches in each plot. The following are the details of experimental design and layout.

(A) Design : Split plot in time
(B) Replications : Three
(C) Treatments : Forty-six including control

The details of layout plan is presented in Fig.1, 2 and 3.

(b) Transplanting of cauliflower seedlings:

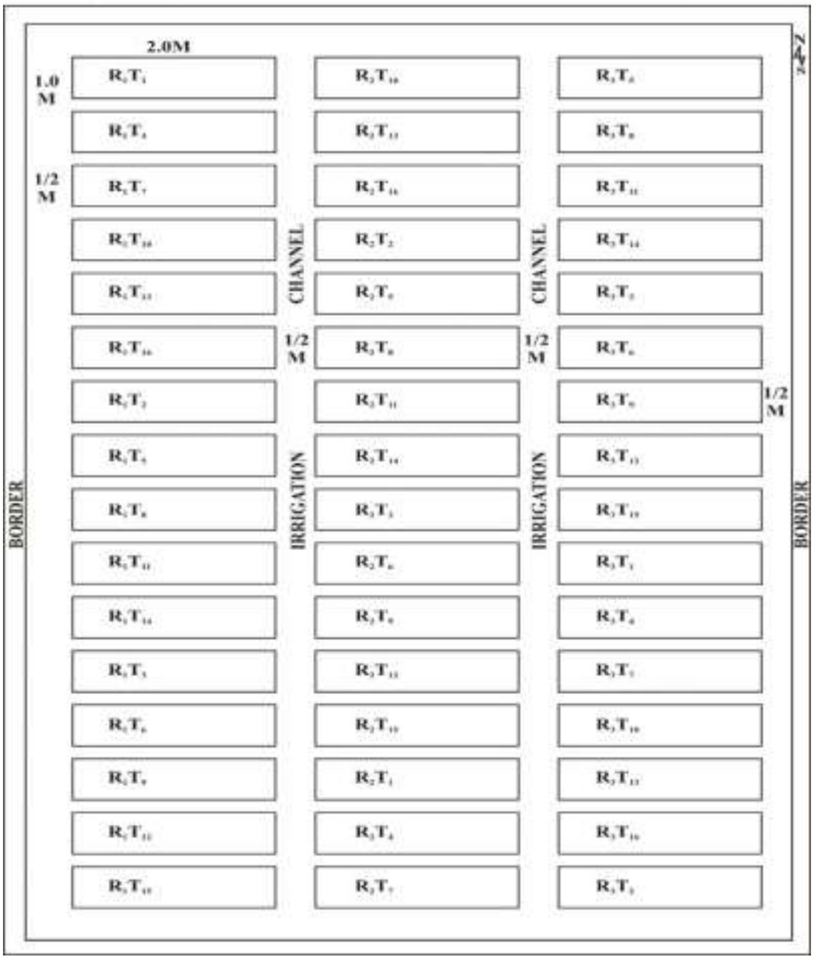
The cauliflower seedlings of variety snow ball were obtained from the Government Vegetable Research Farm, Kalyanpur, Kanpur on transplanted the same day. A plant to plant distance of 60cm and a row to row distance of was kept. The ammonium surplus fertilizer was added to each plot @ 40 gam per plot one month after transplanting, for an even and quick growth of the plant. The seedlings grew well. Irrigation and weeding of the plots were uniformly done at frequent intervals upto 17th January 2023. When the plants were two months old the insecticidal application was done.

(2) Bagrada cruciferum Kirk

I. Field collection of adults and Nymphs

The adults and nymphs of Bagrade cruciferarum Kirk. were found in very large number in the turnip fields of vegetable Research Farm, Kalyanpur, Kanpur in the month of February. These insects were collected early in the morning in small specimen tubes then the insects were transformed in the clean glass jar (23 cm x 15 cm) kept for 24 hour at the constant temperature in the controlled room maintained at 27 ± 1°C. The adults and nymphs of B. cruciferarum Kirk. were provided with fresh turnip leaves. From the collected lot 5th instar nymphs were sorted out randomly utilized for present studies.

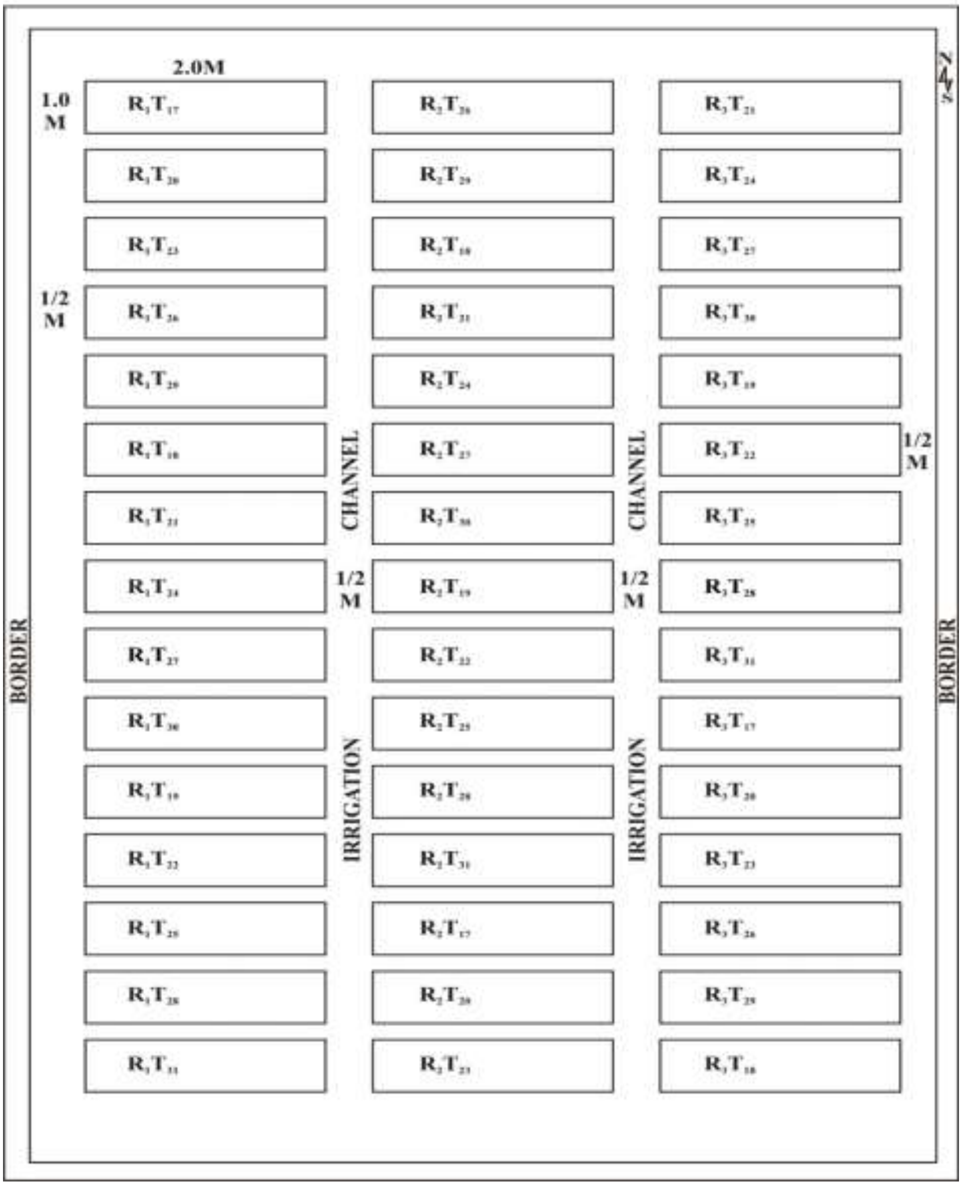
FIG.:1 (PART-1) LAY OUT PLAN OF EXPERIMENTAL FIELD (cauliflower)



Particulars of Fig.1

R	=	Replication	
T	=	Treatment	
T_1	=	Boswellia serrata	0.5 per cent
T_2	=	Boswellia serrata	1.0 per cent
T_3	=	Boswellia serrata	2.0 per cent
T_4	=	Dalbergia latifolia	0.5 per cent
T_5	=	Dalbergia latifolia	1.0 per cent
T_6	=	Dalbergia latifolia	2.0 per cent
T_7	=	Spongomorpha indica	0.5 per cent
T_8	=	Spongomorpha indica	1.0 per cent
T_9	=	Spongomorpha indica	2.0 per cent
T_{10}	=	Cucurma longa	0.5 per cent
T_{11}	=	Cucurma longa	1.0 per cent
T_{12}	=	Cucurma longa	2.0 per cent
T_{13}	=	Piper nigrum	0.5 per cent
T_{14}	=	Piper nigrum	1.0 per cent
T_{15}	=	Piper nigrum	2.0 per cent
T_{16}	=	Control (water+emulsifier)	

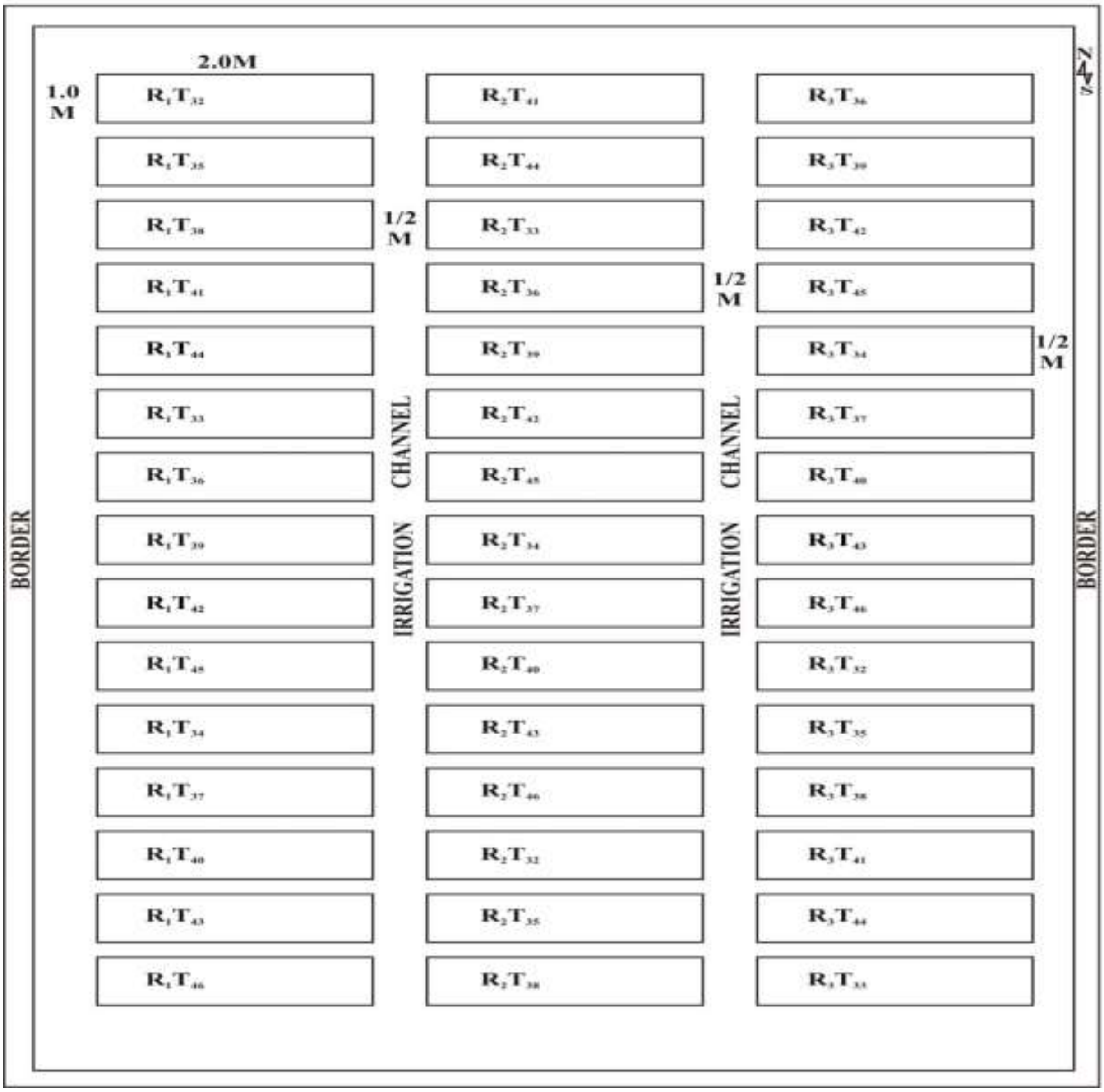
FIG.:2 (PART-II) LAY OUT PLAN OF EXPERIMENTAL FIELD (cauliflower)



Particulars of Fig.2

R	=	Replication	
T	=	Treatment	
T_{17}	=	Mimosa rubicaulis	0.5 per cent
T_{18}	=	Mimosa rubicaulis	1.0 per cent
T_{19}	=	Mimosa rubicaulis	2.0 per cent
T_{20}	=	Annona squamosa	0.5 per cent
T_{21}	=	Dalbergia latifolia	1.0 per cent
T_{22}	=	Dalbergia latifolia	2.0 per cent
T_{23}	=	Acasia intsia	0.5 per cent
T_{24}	=	Acasia intsia	1.0 per cent
T_{25}	=	Acasia intsia	2.0 per cent
T_{26}	=	Cleistanthus collinus	0.5 per cent
T_{27}	=	Cleistanthus collinus	1.0 per cent
T_{28}	=	Cleistanthus collinus	2.0 per cent
T_{29}	=	Azadirachta indica	0.5 per cent
T_{30}	=	Azadirachta indica	1.0 per cent
T_{31}	=	Azadirachta indica	2.0 per cent

FIG.:3 (PART-III) LAY OUT PLAN OF EXPERIMENTAL FIELD (cauliflower)



Particulars of Fig.3

R	=	Replication	
T	=	Treatment	
T_{32}	=	Ocimum basilicum	0.5 per cent
T_{33}	=	Ocimum basilicum	1.0 per cent
T_{34}	=	Ocimum basilicum	2.0 per cent
T_{35}	=	Solanum xanthocarpum	0.5 per cent
T_{36}	=	Solanum xanthocarpum	1.0 per cent
T_{37}	=	Solanum xanthocarpum	2.0 per cent
T_{38}	=	Tagetes indica	0.5 per cent
T_{39}	=	Tagetes indica	1.0 per cent
T_{40}	=	Tagetes indica	2.0 per cent
T_{41}	=	Verbena officinalis	0.5 per cent
T_{42}	=	Verbena officinalis	1.0 per cent
T_{43}	=	Verbena officinalis	2.0 per cent
T_{44}	=	Zingiber officinale	0.5 per cent
T_{45}	=	Zingiber officinale	1.0 per cent
T_{46}	=	Zingiber officinale	2.0 per cent

IV.DISCUSSION

In the present findings the effects of fifteen plant extracts vis., petroleum other extract of *Dalbergia latifalia*, *Spongomarpha indica*, *Mimosa rubicaulis*, *Annona squamosa*, *Acacia intsia*, *Azadirachta indica*, *Ocimum basilicum*, *Tagetes indica*, *Verbena officinalis*, *Zingiber officinale*, *Boswellia serrata*, *Cucurma longa*, *Piper nigrums*, *Cleistanthus callinus* and *Solanum xanthocarpum* were observed to find out their comparative antifeeding and repellent efficacy against *Prodenia litura* unde lab conditions and insecticidal effect against Prodenia litura and *Bagrada cruciferarum* under field conditions. The antifeeding repellent and insecticidal properties of these plant extracts tested against insect-pests of cruciferous vegetables under laboratory cum-field trials and discussed as below:

Antifeeding test:

The summary of results of antifeeding test and relative protectivity on the basis of ED_{50} of different extract against Prodenia litura is shown in Table-41.

It is evident from table that Ocimum basilicum and Piper nigrum were the most effective and placed in the top of the table and *Dalbergia latifolia* was the least effective and placed in bottom. Out of fifteen plant extracts vis., *Ocimum basilicum*, *Piper nigrum*, *zingiber officinale*, Annona squamosa, *Cleistanthus collinus*, *Verbena officinale*, *Acacia instsia*, Spongamorpha indica, *Boswellia serrota*, Tagetes indica, *Solanum xanthocarpum*, *Azadirachta indica*, *Mimosa rubicaulis* and *Cucurma longa* foetida being respectively about 16290.00, 16290.00, 3620.00, 2961.81, 1810.00, 1810.00, 1551.42, 472.17, 191.64, 125.30, 34.65, 12.53, 4.58 and 3.89 time as protective as *Dalbergia latifolia* taken as unity.

Metzger (1987) observed antifeeding and insecticidal properties of bittergourd, *Memordica charantia* Linn. against *Athalia lugens proxima* (Klug) under lab and field conditions. The results of laboratory cum field trials have clearly established that bitterground seed oil (2.0%) emulsion gave complete kill of larvae of mustard sawfly. The death of the larvae due to spray of bitter guard seed oil emulsion of mustard leaves caused partly due to non-feeding of leaves by the larvae and partly due to insecticidal action on the insect. From the findings of Dixit et al. (1999), it was apparent that antifeedent effect of other extract of *Acorus calamus* rhizomes, mechanical extracts of *crinum defium*, *Euphorbia rhizome*, *Lantana camara* var aculeate and Aloe *barbedeneis* leaves against *Athelia procima* Klug. under field conditions was very high. Among all the extracts *Acorus calamus* was proved to be very good plant and showed maximum antifeeding effect to the pest. Thus the present findings are supported by these workers.

Table-41. Order to protectivity of plant extracts against Prodenia Litura Fabr. larvae

S. No.	Plant Extract	Regression equation	ED_{50}	Order of merit	Relative protectivity
1.	*Ocimum basilicum*	y=0.38 x+ 5.09	0.002	I	16290.00
2.	*Piper nigrum*	y=0.43x + 5.29	0.002	I	16290.00
3.	*Zingiber officinale*	y= 0.48x+5.47	0.009	II	3620.00
4.	*Annona squamosa*	y=0.45x + 4.98	0.011	III	2961.00
5.	*Cleistanthus collinus*	y=0.63x+4.83	0.018	IV	1810.00
6.	*Verbena officinalis*	y=0.61x+4.84	0.18	IV	1810.00
7.	*Acacia intsia*	y=0.73x+ 4.77	0.021	V	1551.42
8.	*Spongomorpha indica*	y=1.35x+3.86	0.069	VI	472.17
9.	*Boswellia serrata*	y=1.22x+3.49	0.17	VII	191.64
10.	*Tagetes indica*	y=0.50x+4.12	0.26	VIII	125.30
11.	*Solanum xanthocarpum*	y=0.37x+4.09	0.94	IX	34.65
12.	*Azadirachta indica*	y=0.44x+4.04	2.60	X	12.53

13.	*Mimosa rubicaulis*	y=1.27x+1.39	7.11	XI	4.58
14.	*Cucurma longa*	y=1.68x+0.09	8.36	XII	3.89
15.	*Dalbergia latifolia*	y=1.87x+0.30	32.58	XIXX	1.00

V.CONCLUSION

In conclusion, this study has provided useful insights into the pests affecting cucurbitaceous vegetables and their qualities, giving light on the intricacies of insect-crop interactions in agricultural systems. We have identified and classified major insect pests that pose considerable hazards to cucurbitaceous crops. These pests include, among others, aphids, whiteflies, thrips, beetles, caterpillars, and mites. Our research was conducted through a mix of field surveys, laboratory tests, and literature reviews.

As a result of our examination into the characteristics of these insect pests, we have discovered that they exhibit a wide variety of feeding habits, reproductive methods, and ecological adaptations that determine the impact that they have on vegetables of the cucurbitaceous family. Aphids that feed on sap, caterpillars that eat leaves, and fruit-piercing beetles are all examples of pests that have distinct characteristics that influence their interactions with the plants that they feed on and contribute to the damage that they cause to crops.

In addition, our research has highlighted the importance of integrated pest management (IPM) strategies in mitigating age pest pressure while minimizing environmental risks and increasing agricultural sustainability. Farmers can efficiently manage age age pests and maximize crop yields by integrating cultural practices, biological control agents, botanical pesticides, and targeted chemical interventions.

The significance of our findings lies in the fact that they highlight the necessity of pest management strategies that are adaptable to the various agroecosystems and cropping systems of specific regions. For the purpose of developing targeted and effective control methods that are in accordance with local agricultural practices and environmental conditions, it is essential to have a thorough understanding of the geographical distribution, seasonal dynamics, and natural enemies of natural foes of insect pests.

In addition, our study highlights the significance of stakeholder involvement and capacity building in the process of promoting sustainable pest management practices among farmers, extension agents, academics, and policymakers. We can enhance the resilience and food security of cucurbitaceous crop production systems by facilitating knowledge exchange, stimulating innovation, and supporting community-driven initiatives.

In conclusion, this study adds to the body of knowledge on insect pests that are affecting cucurbitaceous vegetables and lays the foundation for the creation of pest management techniques that are supported by evidence. We are able to handle the issues that are posed by insect pests while also enhancing the sustainability and productivity of cucurbitaceous crop production all over the world by utilizing interdisciplinary approaches and leveraging scientific insights.

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