The Andhra Agric. J 71 (4): 461-465, 2024
doi :10.61657/aaj.2024.162

Impact of integrated pest management practices for the management of budworm in jasmine through Front line demonstration in Nellore district of Andhra Pradesh

V Surekha Devi, D Vijay Kumar Naik, G Lalitha Siva Jyothi and G Narayanaswamy
Krishi Vigyan Kendra, Acharya N G Ranga Agricultural University, Nellore, Andhra Pradesh, India

ABSTRACT

Front line demonstration was conducted on Integrated pest management practices for budworm management in Jasmine, ornamental crop for three years at farmer's field of Nellore district. The pest incidence was recorded after application of IPM practices in demonstration field's. The mean damage of budworm for three years was recorded 17.65% in demonstrated fields and higher incidence of budworm was recorded in farmers practice (37.24%). The IPM practices like spraying of NSKE 5% after proper pruning (Jan), spraying with *Bacillus thuringiensis* 2g/l at 7 days after first spraying, installation of pheromone traps 5 No./acre, light trap 1 No./acre and spraying of Spinosad 0.3 ml or Thaiocloprid 1 ml or Profeinophos 2 ml per liter of water were found effective in controlling the budworm incidence in demonstration field over farmer's field.

Key words: *Budworm management, Front line demonstration, IPM practices and Jasmine*

Jasmine (*Jasminum sambac* Aiton.) is an important ornamental flower crop belongs to family Oleaceae, is grown commercially for loose flowers. Jasmine in Arabic Persian called as Yasmin that means "gift from god". Jasmine buds are used for making garlands, bouquets, decorating women's hair, for religious offerings and for the production of perfumed oils and attars. The dried flowers are also useful for making Jasmine tea (Kamala and Kennedy, 2016). The flowers and other parts of the plant also useful medicines preparation (Krishna Chaitanya and Kumar, 2018).The genus *Jasminum* has more than 200 species of which 40 are indigenous to India. Among these three species (*Jasminum sambac*, *J. auriculatum* and *J. grandiflorum*) are cultivated commercially in India (Pirithiraj *et al*., 2023). *Jasminum multiflorum* is non-fragrant flower species cultivated widely in tropical and subtropical regions (Keshava Reddy and Samata, 2020). The constraints with Jasmine cultivation are non-availability of labour, adverse climatic conditions, high establishment cost, pest and disease incidence. Also high price fluctuation, malpractice by the traders and trader's collusion were the major constraints in the marketing of Jasmine flowers (Kaviarasan *et al*., 2015).

The production of Jasmine flower is affected by various biotic factors, among them insect pests and diseases are the major problems in bud production. The major diseases associated with Jasmine are wilt, leaf blight and rust and insect pests are bud worm (*Hendecasis duplifascialis* Hampson), gallery worm (*Elasmopalpus jasminophagus* Hampson.), leaf web worm (*Nausinoe geometralis* Guenee.), leaf roller, (*Glyphode sunionalis* Hubner.), blossom midge (*Contarinia maculipennis* Felt.) and red spider mite (*Tetranychus urticae* Koch.). Weather conditions like evening relative humidity and crop phenology of Jasmine are favorable for development of these pests throughout the cropping seasons. Among the pests, budworm is major important pest and is cause extensive damage. At initial stage of buds, larva of *Hendecasis duplifascialis* bores and feed on the inner floral structures of bud and it makes a circular hole on the corolla tube, emerges and tunnels to move into other buds of the same shoot. Budworm damaged flowers turn pinkish violet in colour and fall off. In severe case, adjacent flower buds are webbed together and feed on petals also (Kamala *et al*., 2017). Usually, it occurs from April to October months, with the ovipositional peaks in July, August and September months. The total life cycle complete within 24.90 ± 2.03 days, it includes egg stage 3.05 days, larval stage 11.95 days, pupal stage 5.05 days and adult stage 4.95 days and it produces 10-11

overlapping generations in seven months (Krishna Chaitanya and Kumar, 2018). The biology of Jasmine budworm was first time studied by Atwal and Dhaliwal, (2002).

In nature, natural enemies like parasitoids and predators were reported on budworm in Jasmine. The natural enemies on bud worm includes, coccinellid and neuropteran predators, parasitoids like *Bracon* sp. and *Phanerotoma hendecasiella* (Keshava Reddy and Samata, 2020). Most of the Jasmine cultivating farmers adopted pesticides for the management of pests it was 100% in case of budworm and gall midge, 14.67% for nematode and 57.50% for root rot management (Janani *et al*., 2016). For the control of budworm, farmers are used to spray with different insecticides repeatedly during flowering seasons. Repeated spraying of insecticides and lack of awareness on IPM practices for budworm management, the cost of plant protection was increased and also budworm developed resistant to insecticides. Most of the research was conducted on budworm management at Tamil Nadu as it is the major Jasmine cultivating and producing state in India. According to Suganthi *et al*. (2019) due to a lot of labour required for harvesting, only small farmers usually cultivating Jasmine crop. In such cases biological management, botanical applications are cost effective and also bio agents are compatible with cropping conditions. Different biocontrol agents, plant extracts, neem oil (Kamala and Kennedy *et al*., 2016; Suganthi *et al*., 2019) and new insecticide molecules (Venkatesh *et al*., 2022) were evaluated for budworm management in Jasmine.

In Nellore district, mostly small farmers are cultivating Jasmine crop at Buchireddypalem, Kovuru mandals. The higher incidence of budworm was recorded every year and it causes high yield losses. Mostly farmers used insecticides for budworm management and farmers have lack of awareness on IPM practices. Keeping in this view, experiment conducted on demonstration of integrated pest management practice for budworm management in Jasmine.

MATERIAL AND METHODS

Krishi Vigyan Kendra, Nellore conducted Frontline Demonstration (FLD) on budworm management in Jasmine at farmer's field of Buchireddypalem and Kovuru mandals of Nellore district for three years from 2020-2021, 2021-22 and 2022-2023. A total of 15 FLD's were conducted with two treatments i.e. TO1-Demonstration of IPM and TO2-Farmers practice as control treatment, each treatment conducted with 0.4 ha of field. Demonstration (TO1) of IPM practices for budworm management includes soil raking, defoliation of dried and unwanted branches, application of carbofuran 3G @ 40g/plant basally, proper pruning and hygienic maintenance of bushes, spraying of NSKE 5% after proper pruning (during January), spraying with *Bacillus thuringiensis* @ 2 g/lit (7 DAFS), installation of pheromone traps 5 no's per acre and light trap one per acre and spraying of Spinosad @ 0.3 ml or thaiocloprid @1 ml or profenophos @ 2 ml/ lit of water. Above schedule was given to farmer's and followed for budworm management in demonstration field. In farmers practice (TO2), farmers followed spraying of insecticides repeatedly.

The budworm damaged flowers were recorded from both demonstration and farmers practicing fields and calculated budworm incidence using the following formula (Venkatesh *et al*., 2022).

$$\text{Percent budworm incidence} = \frac{\text{Total number of buds with bored holes}}{\text{total number of buds collected}} \times 100$$

The budworm damage was assessed by recording total number of flower buds including damaged buds in five randomly selected plants from each demonstration and farmer practicing fields. The yield data was recorded from demonstrated as well as Farmers' practice fields. The cost of cultivation, gross returns, net returns, B:C ratio and extension gap was also calculated (Vijay Kumar Naik *et al*., 2024).

RESULTS AND DISCUSSION

Budworm incidence

The integrated pest management (IPM) practices were demonstrated in Jasmine for budworm management. The budworm incidence was recorded after application of IPM practices. During 2021-2022, the trial was conducted in farmer's field at Buchireddypalem and Chellayapalem villages and low incidence of budworm damage was recorded in demonstration plot (6.74%) but in case of farmers practiced field higher budworm damage was recorded (39.33%). In the year 2022-2023,

demonstration of IPM practices for budworm management was conducted in farmer's fields at Rebala, Damaramadugu and Veguru villages. Even after implementation of IPM practice, 18.4% budworm damage incidence was recorded in demonstration field and 36.8% incidence in farmer practiced field. In 2023-2024, the higher budworm incidence was recorded in demonstration field over last two years and during this year demonstration was conducted in farmer's fields at Damaramadugu and Rebala villages. Low budworm damage was recorded in demonstrated field (27.8%) compared to farmer practices fields (35.6%) (Table 1).

An average budworm damage incidence for three years (from 2021-2022 to 2023-2024) recorded 17.65% in demonstration fields whereas 37.24% in farmers practiced fields. Suganthi *et al*. (2019) used various botanicals, biocontrol agents and chemicals for budworm and blossom midge management in Jasmine. Among the seven treatments, the treatment includes *Trichogramma chilonis* + *Beauveria bassiana* Bb-5a application caused significantly higher budworm damage reduction *i.e.*, 86.51% damage was reduced in Jasmine. They concluded that integrated use of biocontrol agents and biopesticides can provide reliable and effective pest control in Jasmine while reducing pest management cost and chemical exposure to the growers and workers. In demonstration field *Beauveria bassiana* applied at 7 days after spraying of neem seed kernel extract and observed reduced budworm incidence over farmer practiced field. A total six microbials includes *Metarhizium anisopilae* @ 5g/litre, *Beauveria bassiana* @ 5g/litre, *Paecilomyces fumosoroseus* @ 5g/litre, *Lecanicillium lecani* @ 5g/litre, *Hirsutella thompsonii* @ 10ml/litre, *Bacillus thuriengiensis* var. kurstaki @ 2g/litre were evaluated on the bud worm management at *in vitro* and *in vivo* and also in farmer's fields. Among them *Bacillus thuriengiensis* var. kurstaki effectively controlled budworm incidence i.e., 77.60% incidence was reduced followed by *Beauveria bassiana* it was reduced 74.45% budworm incidence at farmer's field level (Kamala and Kenndy, 2016).

Kamala *et al*. (2017) studied pesticidal effect of plant extracts from different plant parts and plant oils against Jasmine budworm management, of these 5% neem seed kernel extract recorded highest budworm incidence reduction (71.69%). In case of plant oils, neem oil effectively controls the budworm incidence and it was reduced 71.37% budworm damage. In present study, 5% neem seed kernel extract is one of the component in IPM practices, and mean budworm worm damage was reduced to 82.35% in demonstration treatment. Kiran *et al*. (2017) studied seasonal incidence of major insect pests of Jasmine and reported that among the pests, bud borer recorded highest incidence of damage (38.85%). Our results agreed with above results, we recorded 37.24% mean budworm damage in farmers practicing fields.

Yield

After implementation of IPM practices in demonstration fields, the yield was recorded from both demonstration and farmer's practiced fields. The highest flower bud yield was recorded (1232 kg/ha) during 2021-2022 in demonstration fields. In the year 2022-2023 more or less same yield (1189 kg/ha) was recorded in both demonstration and farmer's practicing treatments. An average yield 1140 kg/ha flower buds were recorded in demonstration plot, and 26% of increased yield was recorded in demonstration treatment over farmer practicing treatment (Table.2). Senapati *et al*. (2023) recorded 55.28 q/ha flower bud yield from his experiment field and study was conducted on impact of NPK on quality and yield of floral buds of Jasmine *(Jasminum sambac* Aiton) during summer season at College of Agriculture, O.U.A.T., Bhubaneswar. Performance of different Jasmine (*Jasminum sambac)* varieties under Prayagraj agro-climatic condition was studied and among the seven varieties, Gundumalli performed well with highest yield of 58.4q/ha followed by Single mogra with 48.4q/ha flower yield (Anoopdas and Fatmi, 2022). In Nellore district, flower buds sold with highest price of Rs. 500/- per kg during festival seasons and lowest price was Rs. 125/- per kg flower buds. Tamil Nadu is major Jasmine growing state, recorded highest price for flower buds during July, August and September months (Rs. 200-250 per kg) and lowest i.e. Rs.19.67-63.14 per kg recorded during from March to June (Kousalyaa Devi *et al*., 2019). A precision production technology was developed by TNAU, Coimbatore to increase Jasmine flower bud production, productivity, net income of growers and recorded an average 8 tonnes /ha yield from conventional system of cultivation but

Table 1. Budworm damage incidence of three years from both demonstration and farmer practicing fields.

Year	Budworm incidence (%)		Percent reduction of budworm damage over TO2
	Demonstration (TO1)	Farmer practice (TO2)	
2021-2022	6.74	39.33	82.86
2022-2023	18.4	36.8	50
2023-2024	27.8	35.6	21.91
Average	17.65	37.24	51.59

Table. 2: The yield data and comparative economics studies of Jasmine flower bud's production between demonstration and farmer's practice

Year	Yield Kg/ha		Percent of increased yield	Cost of cultivation (Rs./ha)		Gross return (Rs./ha)		Net return (Rs./ha)		B:C ratio		Extension gap t/ha)
	TO1	TO2		TO1	TO2	TO1	TO2	TO1	TO2	TO1	TO2	
2021-2022	1232	888	38.7	89500	99250	308000	222000	218500	122750	3.4	2.2	344
2022-2023	1189	864	37.6	99200	108500	332920	241920	233720	133420	3.4	2.2	325
2023-2024	998	967	3.15	106282	112300	320775	314762	214493	202462	3	2.8	30.5
Average	1140	907	26	98327	106683	320565	259561	222238	152877	3.3	2.4	233

TO-1: Demonstration field; TO-2: Farmer practicing field

under precision system,yield can be enhanced to 12 -13 tonnes/ha (Bini *et al*., 2018).

Average cost of cultivation per hectare for three years was 98,237/- in demonstration field whereas in farmer practicing field it was 1,06,683/-. The highest gross return recorded in demonstration during 2021-2023 year with 3,32,920/- from hectare and average of three year's gross return was 3,20,565/- from demonstration field and 2,59,561/- from farmer practicing field. The average net return was observed highest from demonstration field (2,22,238/-) over the farmer practicing field (1,52,877/-). Average benefit Cost ratio (B:C ratio) was calculated using gross return and cost of cultivation it was 3.3 and 2.4 in demonstration field and farmer practicing field, respectively.An average of three years,recorded 233 kg of extension gap. Anoopdas and Fatmi (2022) recorded highest B:C ratio (4.15) with Gundumalli and lowest B:C ratio (1.05) with Arkaaradhana varieties cultivated at Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj under Prayagraj agro-climatic conditions. In the present study, highest B:C ratio *i.e.*, 3.4 recorded in demonstration field during both the years 2021-2022 and 2022-2023.

CONCLUSION

From the present study entitled with "Impact of Integrated Pest Management practices for the management of budworm in Jasmine through Front line demonstration in Nellore district of Andhra Pradesh" concluded that integrated management practices for budworm management performed significantly better than repeatedly using insecticides only. The higher yield also recorded from IPM demonstrated fields over farmer practicing field. The gross return, net return and B:C ratio of demonstrated Jasmine field was found more than the farmer practicing field. So IPM practice can be used for the better management of budworm damage in Jasmine. Farmer's impressed about solar insect light trap, neem oil components in IPM package.

Acknowledgment

The authors are thankful to Associate Director of Research, RARS, Tirupati and ANGRAU, Lam, Guntur for providing the necessary facilities and the Director, ATARI Zone X, Hyderabad for providing financial support in carrying out the present investigation.

LITERATURE CITED

Anoopdas S G and Fatmi U. 2022. Performance of different varieties of Jasmine *(Jasminum sambac)* under prayagraj agro-climatic conditions. *International Journal of Plant & Soil Science*. 34(24):965-969.

Atwal A S and Dhaliwal G S. 2002. Pests of Ornamental Plants, Agricultural Pests of South

Asia and their Management. *Kalyani Publishers*. 321-328.

Janani PB, Premavathi R and PuthiraPrathap D. 2016. Technology AdoptionBehaviour of Jasmine Growers–A Critical Analysis. *Journal of Extension Education*. 28(1): 5607-5613.

Kamala M and Kennedy J S. 2016. Evaluation of microbial agents against Jasmine budworm, *Hendecasis duplifascialis* Hampson in Jasmine (*Jasminum sambac* L.). *Current Biotica*.10(3):230-240.

Kamala M, Chinniah C, Kennedy J S, Kalyanasundaram M and Suganthy M. 2017. Pesticidal Effect of Indigenous Plant Extracts Against Jasmine Bud Worm, *Hendecasis duplifascialis* Hampson. in Jasmine (*Jasminum sambac* L.). *International Journal of Tropical Agriculture*. 35(2): 315-323.

Kaviarasan K, Singh DR, Anil Kumar and Prawin Arya. 2015. An economic analysis of Jasmine cultivation in Tamil Nadu. *http://www.biotecharticles.com/Agriculture-Article/An-Economic-Analysis-of-Rose-Production-System-in-Tamil-Nadu-3311.html*.

Keshava Reddy G and Samata H. 2020. Bioecology, damage and management of bud worm, *Hendecasis duplifascialis*is Hampson: An overview. *Pest Management in Horticultural Ecosystems*. 26(1):35-40.

Kiran C M, Jayalaxmi Narayan Hegde, Chakravarthy A K, Thippesha D and Kalleshwarswamy C M. 2017. Seasonal Incidence of Major Insect and Mite Pests of Jasmine. *International Journal of Current Microbiology and Applied Sciences*.6(10): 5060-5070.

Kousalyaa Devi K S, Gopalakrishnan S, Anusuya R and Naveen P. 2019. Research of profitable period for the Jasmine farmers based on its yield estimation and market price using K-means clustering algorithm. *International Journal of Innovative Technology and Exploring Engineering*. 8 (12): 515-517.

Krishna Chaitanya T and Kumar K. 2018. Biological Study of Jasmine Bud Worm, *Hendecasis duplifascialis* Hampsn. (Pyraustidae: Lepidoptera) from India. *International Journal of Current Microbiology and Applied Sciences.*7(06): 2884-2888.

Pirithiraj U, Soundararajan R P and Gailce Leo Justin C. 2023. Seasonal incidence of major insect pests of Jasmine *Jasminum sambac* L. *Indian Journal of Entomology*. 85(2):435-438.

Senapati S K, Sashikala Beura, Ashish Kumar Gouda, Kaberi Maharana, Geeta Pandey, Siddharth Kumar Palai and Sunil Kumar Dash. 2023. Impact of NPK on Quality and Yield of Floral Buds of Jasmine *(Jasminum sambac* L. Aiton) during Summer Season. *Biological Forum – An International Journal.* 15(1): 743-746.

Suganthi A, Saravanan PA, Sritharan S and Jeyarajan nelson S. 2019. Biointensive pest management strategies for the control of bud borer and blossom midge in Jasmine. *Journal of Biological Control.*33(3): 285-290.

Venkatesh H, Ragavendra Achari, Lingamurthy K R, Venkateshalu and Gangadharappa P M. 2022. Efficacy of new insecticide molecules on Jasmine budworm *Hendecasis Duplifascialis* Hampson (Lepidoptera: Crambidae). *The Pharma Innovation Journal*. 2022; 11(10): 1422-1425.

Vijay Kumar Naik D, Siva Jyothi GL, Surekha Devi V, Kiran Kumar Reddy K and Prasanth J. 2024. Synergistic action of combinational fungicides in the management of tikka leaf spot and rust diseases in Groundnut. *Asian Journal of Agricultural Extension, Economics & Sociology*. 42(6): 54-261.

Received on 26.11.2024 and Accepted on 20.12.2024