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Management package for sucking pest of cotton under high density planting system (HDPS)

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ABSTRACT : The field experiment was conducted to devise management package for sucking pest under high density planting system (HDPS) in cotton (Variety CO 17) at Cotton Research Station, Srivilliputtur. The experiment was carried out with four treatments ie T_1. (Seed treatment with Imidacloprid 70 % WS @ 7ml/ kg of seed + need based spray of Diafenthiuron 50% WP @ 600 g/ha or Thiamethoxam 25 % WG @ 100g/ha or NSKE 5%), T_2. (Seed treatment with *Beauveria bassisana* @ 10 g/kg of seed + soil application of *neem* cake @ 250kg/ha + yellow sticky trap @ 40 n/ac release of green lacewing @ 1 lakh eggs/ha at 30 DAS+ need based spray of Dinotefuran 20 % SG @ 150 g/ha or Flonicamid 50% WG @ 150 g/ha or Azadirachtin 10000ppm @ 1 l/ha), T_3. (Farmer practice (Fipronil 5% SC @ 2000ml/ha on 25 DAS + Imidacloprid 30.5 SC@ 75g/ha on 40 DAS + Thiamethoxam 25 % WG @ 100g/ha on 55 DAS), T_4. (Untreated check). The results revealed that sucking pests *viz.*, leafhopper, thrips, whitefly and aphids incidence was minimum (1.72, 1.75, 1.38 and 1.25); seed cotton yield and BC ratio was high (21.56 q/ha and 3.01) in T_2 followed by T_1, T_3 and T_4 under high density planting system on cotton.

Key words: Benefit cost ratio, cotton, HDPS, natural enemies, sucking insect pests, yield

Cotton is an important fibre crop of global significance cultivated in more than seventy countries. It is an important raw material for the Indian textile industry and plays a key role in the national economy in terms of both employment generation and foreign exchange. Cotton is grown in all the three different agro-ecological zones of India *viz.*, northern, central and southern zones. Nearly 70 per cent of the crop is cultivated under rainfed condition in the central and southern regions of the country. Among the cotton producing states, Maharashtra is the largest producer with an area of 38.06 lakh ha followed by Gujarat (24 lakh ha) and Telangana (17.78 lakh ha). In India, the production of cotton is recorded in bales which are of 170 kg. The production is highest in Gujarat with 95 lakh bales followed by Maharashtra (89 lakh bales) and Telangana (59.50 lakh bales). Karnataka stands first in productivity with 769 kg/ha followed by Andhra Pradesh (719 kg/ha) and Rajasthan (692 kg/ha). Therefore, ecofriendly pest management approaches have become a promising option to overcome production constraints. The IPM technologies for cotton have been developed, validated and implemented by cotton growers throughout the country are location specific, economically and ecologically viable (Narula *et al.*, 2001; Kulkarni *et al.*, 2003). Despite yield and economic advantages of HDPS cotton, especially in rainfed and marginal soils, the adoption of closure spacing and high plant density create congenial condition for buildup of pests population (Mohite and Uthamasamy, 1997; Singh *et al.*, 2015). Under these circumstances, the required quantity of applied pesticides may not reach the targeted pests. Hence, attempt the IPM package will used to control the pest and disease in high density planting system in cotton.

The field experiment was conducted to study the management package for sucking pest under high density planting system in cotton (HDPS) in the variety CO 17 at Cotton Research Station, Srivilliputtur. The treatments are T_1. Seed treatment with Imidacloprid (70 % WS) @ 7ml/kg of seed + need based spray of Diafenthiuron (50% WP) @ 600 g/ha or Thiamethoxam (25 % WG) @ 100g/ha or NSKE

(5%); T_2. Seed treatment with *Beauveria bassisana* @ 10 g/kg of seed + soil application of *neem* cake @ 250kg/ha + yellow sticky trap @ 40 n/ac + release of green lacewing @ 1 lakh eggs/ha at 30 DAS+ need based spray of Dinotefuran (20 % SG) @ 150 g/ha or Flonicamid (50% WG) @ 150 g/ha or Azadirachtin (10000ppm) @ 1 l/ha; T_3. Farmer practice (Fipronil (5% SC) @ 2000ml/ha on 25 DAS + Imidacloprid (30.5 SC) @ 75g/ha on 40 DAS + Thiamethoxam (25 % WG) @ 100g/ha on 55 DAS); T_4. Untreated check. Observation of sucking pest *viz.*, leafhopper, thrips, whitefly, aphids, natural enemies, yield and BC Ratio.

The mean population of leafhopper was ranged from 1.72 to 10.66/3 leaves. Seed treatment with *Beauveria bassisana* @ 10 g/kg of seed + soil application of neem cake @ 250 kg/ha + yellow sticky trap @ 40 n/ac + release of green lacewing @ 1 lakh eggs/ha at 30 DAS + need based spray of Dinotefuran (20 % SG) @ 150 g/ha or Flonicamid (50% WG) @ 150 g/ha or Azadirachtin (10000ppm_ @ 1 l/ha was found to be effective against leaf hopper followed by treatment T_1 , T_3 in comparison to T_4 (untreated check -10.66/3 leaves) (Table 1.). The mean population of thrips was ranged from 1.21 to 4.42/3 leaves. The T_2 -Seed treatment with *Beauveria bassisana* @ 10 g/kg of seed + soil application of *neem* cake @ 250 kg/ha + yellow sticky trap @ 40 n/ac + release of green lacewing @ 1 lakh eggs/ha at 30 DAS + need based spray of Dinotefuran (20 % SG) @ 150 g/ha or Flonicamid (50% WG) @ 150 g/ha or Azadirachtin (10000ppm) @ 1 l/ha was found to be effective against thrips (1.21/3leaves) followed by T_1 and T_3 when compared to untreated check (4.42/3 leaves) (Table 1.). Similar trend was observed in whitefly and aphids under high density planting system in cotton (Table 1). The population of natural enemies was high in all the treatment. Mean whitefly population was ranged from 11.25 to 28.69/trap throughout the cropping period. The low number of whitefly adult was recorded in installed the yellow sticky traps (11.25/trap) in treatment T_2-Seed treatment with *Beauveria bassisana* @ 10 g/kg of seed + soil application of *neem* cake @ 250 kg/ha + yellow sticky trap @ 40 n/ac + release of green lacewing @ 1 lakh eggs/ha at 30 DAS + need based spray of Dinotefuran (20 % SG) @ 150 g/ha or Flonicamid (50% WG) @ 150 g/ha or Azadirachtin (10000ppm) @ 1 l/ha followed by T_1 and T_3 when compared to untreated check (28.69 n/trap) (Table 1). The IPM components *viz.*, seed treatment with Imidacloprid (70 WS), okra as a trap crop, installation of pheromone traps, sparying of 5 per cent NSKE, detopping at 80 DAS, target specific chemical interventions with selective insecticides against sucking pests and bollworms, resulted significantly lower population of all major pests and their damage (Patil *et al.*, 2011). The lower pests infestation was recorded in HDPS cotton under the umbrella of IPM practices (Anonymous, 2006).

The highest cotton yield and BC Ratio (21.56 q/ha and 3.01) was recorded in the T_2-Seed treatment with *Beauveria bassisana* @ 10 g/kg of seed + soil application of *neem* cake @ 250 kg/ha + yellow sticky trap @ 40 n/ac + release of green lacewing @ 1 lakh eggs/ha at 30 DAS + need based spray of Dinotefuran (20 % SG) @ 150 g/ha or Flonicamid (50% WG) @ 150 g/ha or Azadirachtin (10000ppm) @ 1 l/ha followed by T_1 and T_3 when compared to untreated check (11.26q/ha and 1.67) (Table 1). Harshana *et al.*, (2017) reported that IPM module comprised seed treatment with Imidacloprid 600 FS, okra as a trap crop, installation of pheromone traps and need based application of selective insecticides in HDPS blocks (45 x 15 cm) registered higher seed cotton yield of ARBC-64 -26.12 and Bindaas BG II -23.95 q/ha as compared to 20.35 and 21.20 q/ha under normal spaced crop (90x 60cm) with a net profit of 90,485/-and 67,508/ha under HDPS as compared to 68,215/and 66,976/ha.

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Table 1. Mean population of sucking pests, natural enemies and yield under HDPS in cotton

Treatments	Mean population								
	Leafhopper (3 leaves)	Thrips (3 leaves)	Whitefly (3 leaves)	Aphid (3 leaves)	Whitefly Trap catches (trap/week)	Coccinellids (Plant)	Spider (Plant)	Yield (q/ha)	BC Ratio
T1	2.34 (1.53)[a]	1.56 (1.25)[ab]	1.03 (1.01)[a]	1.21 (1.10)a	16.65 (4.08)[b]	0.14 (0.37)	0.19 (0.44)[a]	19.35 (4.40)[b]	2.69
T2	1.72 (1.31)[a]	1.21 (1.10)[a]	0.68 (0.82)[a]	0.85 (0.92)[a]	11.25 (3.35)[a]	0.40 (0.63)	0.37 (0.61)[b]	21.56 (4.64)[a]	3.01
T3	3.72 (1.93)[b]	1.92 (1.39)[b]	1.77 (1.33)[b]	1.02 (1.01)[a]	22.24 (4.72)[c]	0.10 (0.32)	0.15 (0.39)[b]	15.45 (3.93)[c]	2.12
T4	10.66 (4.42)[c]	4.42 (2.10)[c]	1.96[b] (1.40)	4.43 (2.10)[b]	28.69 (5.36)[d]	0.08 (0.28)	0.11 (0.33)[b]	11.26 (3.36)[d]	1.67
SEd	0.1334**	0.0918**	0.0919**	0.165**	0.0344**	NS	0.073*	0.0433**	
CD (p = 0.05)	0.326	0.225	0.225	0.408	0.0841	0.248	0.179	0.105	
CV (%)	8.15	7.76	9.88	13.80	0.96	31.66	20.53	1.30	

T1-Seed treatment with Imidacloprid 70 % WS @ 7ml/ kg of seed + need based spray of Diafenthiuron 50% WP @ 600 g/ha or Thiamethoxam 25 % WG @ 100g/ha or NSKE 5%;T2-Seed treatment with Beaveria bassisana @ 10 g/kg of seed + soil application of neem cake @ 250 kg/ha + yellow sticky trap @ 40 nos./acre + release of green lacewing @ 1 lakh eggs/ha at 30 DAS + need based spray of Dinotefuran 20 % SG@ 150 g/ha or Flonicamid 50% WG @ 150 g/ha or azadirachtin 10000ppm @ 1 lit./ha;T3-Farmer practice (Fipronil 5% SC@ 2000ml/ha on 25 DAS + Imidacloprid 30.5 SC@ 75g/ha on 40 DAS + Thiamethoxam 25 % WG @ 100g/ha on 55 DAS);T4-Untreated check

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