Progressive Agriculture 31 (2): 89-93, 2020 **ISSN: 1017 - 8139**

Progressive Agriculture
Journal homepage:http://www.banglajol.info/index.php/PA

Integrated pest management approach to control thrips of roses

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Abstract

The experiment was conducted at established rose garden of Regional Agricultural Research Station, Bangladesh Agricultural Research Institute, Jashore during 2017-18 and 2018-19 winter season (November-April). The experiment was laid out in a RCBD design with three dispersed replications. Four treatment combination were as follows: T_1 =IPM package-1: Mechanical control + Sticky trap (Blue and White) + weekly spray of Azadirechtin (Bio-neem plus 1EC) @ 1.0ml/L of water, T_2 = IPM package-2: Mechanical control+ Sticky trap (Blue and White)+ spray of Thiamethoxam 20% (Virtako 40SC) @ 1.5 ml/L of water, T_3 = IPM package-3: Mechanical control+ Sticky trap (Blue and White)+ weekly spray Chlorphenapyr (Intrepid 10EC) @ 1 ml/L of water and T_4 = Farmers practice: weekly spray Imidacloprid (Imitaf 20SL) @ 0.5ml/L of water. For mechanical control hand picking was done and harmful insect also classified as the most direct and the quickest way to remove clearly visible pests. Two color stiky trap (white and blue) were set up in each line. The lowest number of rose thrips was found in IPM package 2 (6.36 in 2017-18 and 3.03 in 2018-19) and highest in farmer's practices (14.36 in 2017-18 and 12.40 in 2018-19). The lowest percent flower infestation of rose was recorded in IPM package 2 (9.98 to 17%) and the highest in Farmers practice (19.72 to 32.66%). The highest yield (864000 no./ha in 2017-18 and 535932 no./ha) was recorded from IPM package 2 and the lowest in farmers practice (438750 no./ha in 2017-18 and 388857 no./ha). The results revealed the highest MBCR was observed in IPM package-2 (Mechanical control+ Sticky trap (Blue and White) + spray of Thiamethoxam 20% (Virtako 40SC) @ 1.5 ml/L of water.) treated plot (17.2 to 49.7) in both the year. Finally, it may be recommended that IPM package 2 is very much effective to control thrips of rose as well as high yield and more economic return.

Key words: Rose, thrips, IPM. sticky trap, yield

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Introduction

Rose, a universally celebrated flower, has been used as a garden plant since the dawn of civilization. Rose is a symbol of perfection, elegance, romance and love (Elgimabi, 2011). It was called "The Queen of Flowers" firstly by Greek poetess in her "Ode to the Rose" (Muhammad *et al.,* 1996). It is used in different type of personal, social, and official marriage ceremony, national days, official inaugurations. Generally, rose could be cultivated in pot, home garden, and commercially in the farmer's field. However, sseveral types of pests such as aphids, thrips, scale insects, spider mites were recorded during rose cultivation in different region (Handayati, & Sihombing, 2017). Jashore is the most commercial rose

production area in Bangladesh. Currently, In Jashore about 202 acres of land (40% of total rose area of Bangladesh) are under rose cultivation and produced 18867 metric ton (BBS, 2017). Farmers of these areas grow different types of flowers including rose. Rose production farmers faces different type of insect problem like thrips, mite etc. Therefore, rose is also attacked by different types of insect pests and causes considerable losses. According to the growers up to 80% flowers could be infested during growing season field (personal communication). Thrips are tiny, slender insects with fringed wings. Most adult thrips are elongate, slender, minute (less than 1/20 inch long), and have long fringes on the margins of both pairs of their long, narrow wings. Immatures (called larvae or nymphs) are oblong or slender and elongate and lack wings. Most thrips range in color from translucent white or yellowish to dark brown or black. They feed by puncturing the epidermal (outer) layer of host tissue and sucking out the cell contents, which results in stippling, discolored flecking, or silvering of the leaf surface. Thrips feeding is usually accompanied by black varnish like flecks of frass. This insect bore flower bud, leaf etc. and deteriorated the flower quality and affect the longevity of flower. On roses, thrips damage is visible on young shoots (yellow spots and deformations) but is most important on the flowers. The punctures and egg-laying wounds cause necrosis of petals and sepals. Petal drop out within very-short time which is very pathetic to farmer and drastically hamper the rose production. Thrips are difficult to control. There have very little information about the management of thrips in rose. However, an integrated management practices combines the use of good cultural practices, natural enemies, and the most selective or least-toxic insecticides that are effective in control the attack of thrips in roses. Keeping this view in mind the experiment was designed to find out the suitable approach to control thrips of roses eco-friendly.

Materials and Methods

The experiment was conducted during winter season (November-April) in 2017-18 and 2018-19 at established rose garden of Regional Agricultural Research Station, Bangladesh Agricultural Research Institute, Jashore. The experiment was laid out in a randomized complete block design with three dispersed replications. Plant to plant distance was 1m and line to line distance was 3m. 10 plants were selected from each line. The treatments were as follows: T_1 =IPM package-1: Mechanical control + Sticky trap (Blue and White) + weekly spray of Azadirechtin (Bio-neem plus 1EC) @ 1.0ml/L of water, T_2 = IPM package-2: Mechanical control+ Sticky trap (Blue and White)+ spray of Thiamethoxam 20% (Virtako 40SC) @ 1.5 ml/L of water, T_3 = IPM package-3: Mechanical control+ Sticky trap (Blue and White)+ weekly spray Chlorphenapyr (Intrepid 10EC) @ 1 ml/L of water and T_4 = Farmers practice: weekly spray Imidacloprid (Imitaf 20SL) @ 0.5ml/L of water. The normal intercultural operations were done as and when necessary. For mechanical control hand picking was done and harmful insect also classified as the most direct and the quickest way to remove clearly visible pests. Two color sticky trap (white and blue) were set up in each line. The whole plant was thoroughly covered by spray emulsion. 5 flowers were randomly taken from 3 plants were takenfor counting the number of thrips per plant and % flower infestation.

Yield was taken from the selected ten plants and converted to no/ha. Data were analyzed by ANOVA (using Crop Stat 7.2) to evaluate differences between treatments, and the means were separated using least significant difference (LSD) at the 5% level of significance (p & lt;0.05).

Results and Discussion

***Effect of different IPM packages against thrips of roses during 2017-18*:** The effect of different treatment packages on rose against thrips are presented in Table 1. The lowest number of thrips in rose was found in

IPM package 2 (6.36) and the highest in farmer's practices (14.36). The lowest percent flower infestation of rose was recorded in IPM package 2 (9.98%) and the highest in Farmers practice (19.72%). The highest yield (864000 no./ha) was recorded from IPM package 2 and the lowest in farmers practice (438750 no./ha).

Table 1. Effect of different treatment package on rose against thrips during 2017-18.

Treatments	No. of thrips/flowers /plants	% Flower infestation	Yield (no./ha)
T1	12.50	16.19	587250
T2	6.36	9.98	864000
T3	9.67	12.78	715500
T4	14.36	19.72	438750
LSD $_{(0.05)}$	2.19	1.84	87104.7
CV (%)	10.94	4.86	6.70

T_1 =IPM package-1: Mechanical control + Sticky trap (Blue and White) + weekly spray of Azadirechtin (Bio-neem plus 1EC) @ 1.0ml/L of water, T_2 = IPM package-2: Mechanical control+ Sticky trap (Blue and White) + spray of Thiamethoxam 20% (Virtako 40SC) @ 1.5 ml/L of water, T_3 = IPM package-3: Mechanical control + Sticky trap (Blue and White) + weekly spray Chlorphenapyr (Intrepid 10EC) @ 1 ml/L of water and T_4 = Farmers practice: weekly spray Imidacloprid (Imitaf 20SL) @ 0.5ml/L of water. In Bangladesh the overall reports on pheromone use in IPM and notice by Islam and Ando (2012) and Islam (2012). In flower pests, such technology is almost newer in Bangladesh to control thrips.

***Effect of different IPM packages against thrips of roses during 2018-19*:** There was also a significant effect of different treatment packages on rose against thrips during 2018-19 (Table 2). Likewise, in the first year, the lowest number of thrips in rose was found in IPM package 2 (3.03) and the highest in farmer's practices (12.40). The lowest percent flower infestation of rose was recorded in IPM package 2 (17.00%) and the highest in Farmers practice (32.66%). The highest yield (535932 no./ha) was recorded from IPM package 2 and the lowest in farmers practice (388857 no./ha). The highest yield in T_2 (IPM package 2) may be due to the less infestation of roses by thrips as well as control the thrips infestation rate. In our research, spray of Thiamethoxam 20% (Virtako 40SC) @ 1.5 ml/L of water with stick trap (blue and white) + mechanical control reduced the thrips infestation in both the year. Gupta (2013), reported that imidacloprid drench was the most effective for thrips control in rose. The author also reported that the application of Spinosad-alone, or comination of some other combinations such as imidacloprid + spinosad, imidacloprid + emamectin benzoate, acetamiprid + spinosad, acetamiprid + emamectin benzoate also gave significant control of thrips at four days after spraying.

Table 2. Effect of different treatment package on rose against thrips during 2018-19.

Treatments	No. of thrips/flowers /plants	% Flower infestation	Yield (no./ha)
T1	9.70	27.66	458823
T3	6.00	23.66	506186
T4	12.40	32.66	388857
LSD $_{(0.05)}$	4.98	7.36	24188.8
CV (%)	32.02	14.60	2.562

T_1 =IPM package-1: Mechanical control + Sticky trap (Blue and White) + weekly spray of Azadirechtin (Bio-neem plus 1EC) @ 1.0ml/L of water, T_2 = IPM package-2: Mechanical control+ Sticky trap (Blue and White) + spray of Thiamethoxam 20% (Virtako 40SC) @ 1.5 ml/L of water, T_3 = IPM package-3: Mechanical control+ Sticky trap (Blue and White) + weekly spray Chlorphenapyr (Intrepid 10EC) @ 1 ml/L of water and T_4 = Farmers practice: weekly spray Imidacloprid (Imitaf 20SL) @ 0.5ml/L of water.

***Economic analysis*:** Economic analysis for the management of thrips in rose was calculated separately

and presented in Table 3 and 4. The highest gross return (864000 Tk./ha) observed form IPM package 2 due to the more no. of rose production and the lowest was in farmers practice (438750 Tk./ha). The results revealed the highest MBCR was observed in IPM package-2 (Mechanical control+ Sticky trap (Blue and White) + spray of Thiamethoxam 20% (Virtako 40SC) @ 1.5 ml/L of water.) treated plot (49.7).

Table 3. Economic analysis of different management tactic against thrips of rose during 2017-18.

Treatments	Yield (no./ha)	Gross return (Tk/ha)	Cost of treatments (Tk/ha)	Net return (Tk/ha)	Adjusted Net return (Tk/ha)	MBCR
T_1	587250	587250	83050	504200	139650	16.8
T_2	864000	864000	82750	781250	416700	49.7
T_3	715500	715500	82600	632900	268350	32.9
T_4	438750	438750	74200	364550	-	-

Cost of relevant materials or activities: [1]Farmgate price of rose @ Tk. 1.00/piece, [Cost of Azadirechtin (Bio-neem plus 1EC) @ 230Tk/100ml, Thiamethoxam 20% (Virtako 40SC) @ 140Tk/10g, Chlorphenapyr (Intrepid 10EC) @ 200Tk/100ml, Imidacloprid (Imitaf 20SL) @ 240 Tk/100ml, Sticky trap (Blue and White) @ 35Tk/trap, Cost of mechanical control: Three labours/spray/ha @ Tk 300/labour/day; Cost of spray: Two labours/spray/ha @ Tk 300/labour/day, Spray volume required: 500L/ha].

Table 4. Economic analysis of different management tactic against thrips of rose during 2018-19.

Treatments	Yield (no./ha)	Gross return (Tk/ha)	Cost of treatments (Tk/ha)	Net return (Tk/ha)	Adjusted Net return (Tk/ha)	MBCR
T_1	458823	458823	82980	375843	61186	7.97
T_2	535932	535932	82750	453182	138525	17.2
T_3	506186	506186	82530	423656	108999	14.1
T_4	388857	388857	74200	314657	-	-

Cost of relevant materials or activities: [1]Farmgate price of rose @ Tk. 1.00/piece, [Cost of Azadirechtin (Bio-neem plus 1EC) @ 230Tk/100ml, Thiamethoxam 20% (Virtako 40SC) @ 140Tk/10g, Chlorphenapyr (Intrepid 10EC) @ 200Tk/100ml, Imidacloprid (Imitaf 20SL) @ 240 Tk/100ml, Sticky trap (Blue and White) @ 35Tk/trap, Cost of mechanical control: Three labours/spray/ha @ Tk 300/labour/day; Cost of spray: Two labours/spray/ha @ Tk 300/labour/day, Spray volume required: 500L/ha].

Similar like the first year, the highest gross return showed from the IPM package 2 (535932 Tk./ha) and the lowest in farmers practice (388857 Tk./ha) presented in table 4. The gross return was low in the second year due to the less yield of rose. Finally, the highest MBCR was observed in IPM package-2 (Mechanical control+ Sticky trap (Blue and White) + spray of Thiamethoxam 20% (Virtako 40SC) @ 0.15 g/L of water.) treated plot (17.2).

Conclusion

From the above results it may be concluded that the IPM package 2 (Mechanical control + Sticky trap (Blue and White) + spray of Thiamethoxam 20% (Virtako 40SC) @ 0.15g/L of water.) was more effective for control thrips of rose in respect of reducing flower infestation, highest yield and economic return. Finally, the application of Thiamethoxam 20% @ 0.15g/L

(Virtako 40SC) with sticky trap (blue and white) may be recommended to the thrips management in roses.

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