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EFFECT OF GAUCHO-FERTILIZER INTERACTION AND AGRONOMIC CHARACTERS ON THE INCIDENCE OF PESTS OF SMOOTH AND HAIRY VARIETY OF COTTON IN BANGLADESH

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ABSTRACT

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Fuzzy seeds of both smooth and hairy variety of cotton were treated by 5 dosages of Gaucho during 2005-06 at Sadarpur, Dinajpur. The results were compared with monocrotophos and untreated control. Efficacy of Gaucho on several insect pests of cotton in relation to standard and increased dosages of fertilizer was evaluated. Results indicated that the increased dosages of fertilizers improved plant quality for more insects attack in both treated and untreated control plants. Improvement of agronomic characters of cotton plant was demonstrated due to Gaucho treatment compared to monocrotophos and control.

Key words: *ecology, gaucho, monocrotophos, thereshold, delinted, fuzzy*

INTRODUCTION

Nutrient status of the soil is one of the important factor for the luxuriant growth and development of the plant. But balance of nutrient can makes the crop risk free. Excess nutrient resulting lush, rank of growth that attracts more pests and increases the problem of the control and loss of matured bolls due to fungus rots. Cisneros *et al.* 1998 reported that aphids (*Aphis gossypii*) from plots receiving high N rates were less susceptible to Capture and Provado but more susceptible to endosulfan than the aphids from low nitrogen plots. Nitrogen also affected the population dynamics of naturally occurring aphids with higher densities in plots receiving high N rates. So fertilizer should be applied generously. Four differential nitrogen regimes (50 to 200 lbs./nitrogen) were examined on cotton aphid, *Aphis gossypii* Glover and there was consistently a trend for more aphids in the 200 lbs./A nitrogen treatment compared with the 50 lb./A treatment with a 3-4 times range across the treatments. The number of offspring per adult averaged 1.7 and 5.3 under 20 and 250 lbs./A nitrogen regimes, respectively and negative effect of potassium on aphid fitness was seen by Godfrey *et al.* 2000. Cotton root may access to nutrients remaining in the top 30 cm of the soil. For the affectivity nitrogen can be applied in split dosages, K, MOP and S are of important nutrients. Lack of Boron has marked effect on yield. Lack of Mg also affect in plant growth. Lime should be incorporated into soil if it is too acid. The rank growth normally attracts cotton pests. Gaucho, the systemic product can prevent the crop for a longer period with standard dosages. Almand 1995 reported that the Gaucho treated seed increased plant size and early square setting and resulted greater yield. But higher dose usually soften the plants with soluble nutrient and attracted the sucking and chewing pest of cotton. Epperlein *et al.* 1997 reported that seed treatment on smaize with imidacloprid (Gaucho) controlled aphid, *Rhopalosiphum padi* and resulted positive effects on plant height, plant weight, cob weight. Graham *et al.* 1995 evaluiated GAUCHO 480 (imidacloprid) and Temik (aldicarb) on cotton in Mississippi during 1994. Results indicate the increased percent of square retention, total square counts and bloom counts. Modern pest management project include interactions between control tactics and fertilizer issues. Moreover, various agronomic features are very crucial parameters for any sustainable pest management program. Sometimes bigger plant height and large canopy volume enhances the hiding of insect population. Faircloth *et al.* 2002 conducted field experiments in 1997-1999 in USA on cotton thrips. Thrips species were differed among the years. In 1997, the aldicarb treatment resulted in a better "earliness profile" (lower fruit set and more early opening bolls) than either acephate or imidacloprid, while in 1998 and 1999 there were few differences among the parameters. Herbert, 1998 found that the imidacloprid treated plants were taller and had more reproductive structures compared with untreated control. Lentz *et al.* 2000 compared new insecticide, Adage TM(thiamethoxam), to recommended standards, Temik (aldicarb) and Gaucho (imidacloprid), against cotton thrips and for its effect on plant growth and development. Results showed that Bloom counts were higher in the highest rate Adage treatment compared to Temik, Gaucho, and the untreated. Cook *et al.* 1999 conducted field studies in Louisiana showed that Orthene 80S and 90S [acephate], Gaucho 3.84S [imidacloprid], Admire 2F [imidacloprid] and Temik 15 G [aldicarb] provided a satisfactory level of control of thrips [Thripidae] on cotton. Counting of lower sympodia resulted low yield. So, improved performances of agronomic characters such as plant height, rooting length, and number of sympodia, number of monopodia, flowering date, and number of bolls, boll weight, bolls split and number of harvest are important parameters in yield assessment.

MATERIALS AND METHODS

The experiment for the control of aphid was carried out during 2001-02 to 2003-04. The details of the insecticides and dosages are given in table-1. The relative efficacy of Gaucho on the basis of increasing dosages and degree of suppression recorded during scouting. The treatment plot dimensions were 10m x 10m, laid out in a randomized complete block design, 7 treatments and replicated four times. The spacing between plot to plot 1m and 2m foot path respectively.

The seed was treated with the seed dressing chemical, Gaucho-70ws by different doses and compared it with the standard dose of monocrotophos-40wsc and untreated check. The treatments were:

a) Gaucho-70ws-1.50gm/kg seeds
b) Gaucho-70ws-2.50gm/kg seeds
c) Gaucho-70ws-3.50gm/kg seeds
d) Gaucho-70ws-4.50gm/kg seeds
e) Gaucho-70ws-5.50gm/kg seeds
f) Monocrotophose-40wsc-1120ml/ha
g) Untreated check (water spray)

The fuzzy and delinted seeds of both varieties soaked in water within a plastic boll for half an hour and then remove water to make it a little bit dry. The powdered Gaucho poured into the bowl and stirred for 10-15 minutes for complete adherence of the chemical to the individual seed coat. It was dried in the sun for 30-45 minutes over a clean floor or on paper and was sown in the trial plot. Thorough examination of plants were done randomly in the field. Five plants were taken from each replication by random selection. Twenty plants were scouted from each treatment unabashedly. Sprays were applied when the pest levels exceeded the relevant threshold at regular weekly counts. Monocrotophos 40EC was applied to suppress the pest below ETL. In case of untreated check only water was sprayed. Spraying was done by the knapsack spray using the rate 1120 ml & volume 100-200 liters/ha.

RESULTS AND DISCUSSION

Gaucho-fertilizer interaction

The mean count of jassid in smooth variety due to Gaucho varied from 1.10-2.01 in standard and 1.30-2.20 in increased dose of fertilizer compared with 1.96 and 2.15 in monocrotophos and 7.75-8.30 in control respectively with significant variation. Mean aphid grade varied from 0.99-1.91 in standard dose and 1.0-2.0 in increased dose due to Gaucho application compared to 1.88- 1.90 in monocrotophos and 3.75-4.00 in the controls with significant statistical variations. Aphid grade was gradually declined with the increasing doses of Gaucho. Data on fuzzy number per plant ranged from 2.71-5.0 in standard doses and 2.60-6.15 in increased dose compared to 4.75-5.0 in monocrotophos and 9.50-10.80 in the control. There were significant statistical variations in the fuzzy number among the treatments. Gaucho and monocrotophos had significantly lower fuzzy than the control. 3.5g-5.5g Gaucho also gave significantly lower fuzzy than monocrotophos. Increased dose of fertilizer always showed higher thrips per plant than the standard dose irrespective of the treatment. In the increased dose mean thrips per plant varied from 3.70-6.75 with Gaucho while it was 6.15 with monocrotophos and 14.0 in the control. In the standard dose mean thrips per plant varied from 3.26-6.43 with Gaucho while it was 5.75 with monocrotophos and 12.50 in the control. Increased dose dies of Gaucho always decreased thrips number per plant. Number of spotted bollworm per plant varied from 0.14-0.24 in SD and 0.16-0.25 due to Gaucho and monocrotophos application compared to 0.48-0.50 in the control. Both Gaucho and monocrotophos treatment had significantly lower spotted bollworm population than the controls. Incidence of American bollworm on the average varied from 0.13-0.23 in standard dose and 0.18-0.26 in increased dose due to various Gaucho doses and the monocrotophos compared to 0.41-0.52 in the untreated control respectively. Increased dose dies had always little more American bollworm than the standard dose. Gaucho and monocrotophos showed significantly lower population than the controls. 4.5 and 5.5g Gaucho gave significantly lower American bollworm incidence in the standard dose over monocrotophos while Gaucho and monocrotophos impact differed insignificantly (Table 1).

Table 1. Effect of Gaucho-fertilizers interaction on incidence of pests of smooth cotton during 2005-06

Doses Gaucho/kg seeds, ml/ha	Jassid number/plant		Aphid grade/plant		Whitefly number/plant		Thrips number/plant		Spoted bollworm/plant		American bollworm/plant	
	Std	Inc	Std	Inc	Std	Inc	Std	Inc	Std	Inc	Std	Inc
Gaucho-1.50g	2.01b	2.20b	1.91c	2.0c	5.00c	6.15d	6.43c	6.75b	0.24b	0.25a	0.23b	0.26a
Gaucho-2.50g	1.91b	2.0b	1.69c	1,75b	4.75c	5.0c	5.68c	6.0b	0.21a	0.22a	0.22b	0.23a
Gaucho-3.50g	1.75b	1.80a	1.55b	1.60b	3.67b	4.20b	5.14b	5.50b	0.19a	0.21a	0.20ab	0.22a
Gaucho-4.50g	1.41a	1.65a	1.33b	1.45b	2.49a	2.75a	4.29a	4.50a	0.18a	0.20a	0.17a	0.20a
Gaucho-5.50g	1.10a	1.30a	0.99a	1.0a	2.71a	2.60a	3.26a	3.70a	0.14a	0.16a	0.13a	0.18a
Monoct-1120ml	1.96b	2.15b	1.88c	1.90c	4.75c	5.0c	5.75b	6.15b	0.22a	0.23a	0.22b	0.24a
Control	7.75c	8.30c	3.75d	4.0d	9.50d	10.80e	12..50d	14.0c	0.48c	0.50b	0.41c	0.52b
LSD (0.05)	0.48	0.54	0.33	0.33	0.44	0.52	1.36	1.75	0.09	0.10	0.08	0.09

- Means followed by same alphabets do not differ significantly (P>0.05) by DMRT
- Small letters indicate comparison within column
- Std.-standard dose of fertilizer
- Inc- Increased dose of fertilizer

The mean count of jassid in smooth variety due to Gaucho varied from 0.82-2.10 in standard and 1.00-2.20 in increased dose of fertilizer compared with 1.62 and 1.85 in monocrotophos and 7.00-8.00 in control respectively. Mean aphid grade varied from 0.95-1.86 in standard dose and 1.10-1.90 in increased dose due to Gaucho application compared to 1.65-1.70 in monocrotophos and 4.00-4.10 in the controls with significant statistical variations. Data on fuzzy number per plant ranged from 3.31-5.88 in standard doses and 4.00-6.50 in increased dose compared to 4.50-4.81 in monocrotophos and 11.88-12.0 in the control. There were significant statistical variations in the fuzzy number among the treatments. Gaucho and monocrotophos had significantly lower fuzzy than the control. 3.5g-5.5g Gaucho also gave significantly lower fuzzy than monocrotophos. Increased dose of fertilizer always showed higher the per plant than the standard dose irrespective of the treatment. In the increased dose mean thrips per plant varied from 3.10-7.00 with Gaucho while it was 6.50 with monocrotophos and 12.0 in the control. In the standard dose mean thrips per plant varied from 2.94-6.75 with Gaucho. While it was 5.50 with monocrotophos and 10.25 in the control. Increased dose of Gaucho always decreased thrips number per plant. Number of spotted bollworm per plant varied from 0.17-0.36 in spotted bollworm and 0.19-0.40 in increased dose due to Gaucho and monocrotophos application compared to 0.53-0.60 in the control. Both Gaucho and monocrotophos treatment had significantly lower spotted bollworm population than the controls. Incidence of American bollworm on the average varied from 0.19-0.26 in standard dose and 0.20-0.35 in increased dose due to various Gaucho doses and the monocrotophos compared to 0.54-0.55 in the untreated control respectively. Increased dose had always little more American bollworm than the standard dose. Gaucho and monocrotophos showed significantly lower population than the controls. 4.5 and 5.5g Gaucho gave significantly lower American bollworm incidence in the standard dose over monocrotophos while Gaucho and monocrotophos impact differed insignificantly. The control plants always gave significantly higher no of insects than monocrotophos and Gaucho. 4.5g and 5.5g Gaucho caused significant reduction of increased dose aphid grade thrips and spotted bollworm in increased dose and aphid grade and thrips in standard dose than those of monocrotophos. 3.5g Gaucho also caused significant reduction of thrips and spotted bollworm in increased dose than monocrotophos. 3.5g Gaucho showed significant increase of fuzzy in standard dose. 2.5g Gaucho recorded significantly higher fuzzy in both standard dose and increased dose and American bollworm in increased dose than monocrotophos. 1.5g Gaucho on the other hand always gave higher insects than monocrotophos. It also recorded higher insect incidence than higher doses of Gaucho in many occasions (Table 2).

Table 2. Effect of Gaucho-fertilizers interaction on incidence of pests of hairy cotton during 2005-06

Doses Gaucho/kg seeds, ml/ha	Jassid number/plant		Aphid grade/plant		Whitefly number/plant		Thrips number/plant		Spoted bollworm/plant		American bollworm/plant	
	Std	Inc	Std	Inc	Std	Inc	Std	Inc	Std	Inc	Std	Inc
Gaucho-1.50g	2.10b	2.20c	1.86d	1.90c	5.88b	6.50b	6.75c	7.0b	0.36b	0.40c	0.26b	0.35b
Gaucho-2.50g	1.62a	1.70b	1.57c	1.60b	5.50b	6.0b	5.74b	6.50b	0.24a	0.32b	0.24a	0.30b
Gaucho-3.50g	1.42a	1.56b	1.41b	1.52b	5.75b	5.80a	4.73b	5.0a	0.21a	0.22a	0.22a	0.24a
Gaucho-4.50g	1.15a	1.20a	1.27b	1.30a	4.04a	4.30a	3.68a	4.70a	0.19a	0.21a	0.20a	0.23a
Gaucho-5.50g	0.82a	1.0a	0.95a	1.10a	3.31a	4.0a	2.94a	3.10a	0.17a	0.19a	0.19a	0.20a
Monoct-1120ml	1.62a	1.85b	1.65bc	1.70b	4.81a	4.50a	5.50b	6.50b	0.24a	0.30b	0.24a	0.26a
Control	7.00c	8.00d	4.00e	4.10d	11.88c	12.0c	10.25d	12.0c	0.53c	0.60d	0.54c	0.55c
LSD (0.05)	0.92	0.46	0.19	0.22	1.92	1.94	1.98	1.99	0.08	0.09	0.07	0.08

- Means followed by same alphabets do not differ significantly (P>0.05) by DMRT
- Small letters indicate comparison within column
- Std.- standard dose of fertilizer
- Inc- Increased dose of fertilizer

Incidence of jassid, aphid, whitefly, thrips, spotted bollworm and American bollworm varied from 0.13-6.43 due to Gaucho, 0.22-5.75 in monocrotophos and 0.41-12.50 in the controls in standard compared to 0.16-6.75, 0.23-6.15 and 0.50-14.0 due to Gaucho, monocrotophos and controls respectively in increased dose of smooth variety. Incidence of jassid, aphid, whitefly, thrips, spotted bollworm and American bollworm ranged from 0.19-2.94 due to Gaucho, 0.24-5.50 in monocrotophos and 0.53-10.25 in the controls in standard compared to 0.19-3.10, 0.26-6.50 and 0.55-12.0 due to Gaucho, monocrotophos and controls in increased dose of hairy variety (Table 1-2).

Agronomic characters

Looking in to the various agronomic features of crop plant in relation to pest control efforts is a very crucial parameters for any sustainable pest management program. In this study attempts was taken to evaluate impact on several agronomic characters of cotton plants viz. plant height, rooting length, number of sympodia, number of monopodia, 1st flowering date, number of bolls produced, bolls split time, boll weight and number of harvest. Several workers reported on imidacloprid impact on plant height, sympodia, monopodia, flowers, bollweight and boll split are given below.

Table 3 shows the effect of Gaucho on various agronomic parameters of smooth variety of cotton during 2005-06. Gaucho treatment significantly affected the height range of plants. 1.50-5.5g Gaucho greatly increased plant height (87.25-108.87 cm) compared to 88.12 cm in monocrotophos and 71.37cm in the control plots. Increasing dose of Gaucho gave taller plants. Number of sympodia was significantly different among the Gaucho treated plants. It varied from 14.25-27.63. The increasing doses of Gaucho increased the number of sympodia compared to monocrotophos. The untreated control produced the lowest number (10.88) of sympodia. The lowest number of monopodia (3.50) produced at the highest doses of Gaucho. The gradual decrease of Gaucho had increased the number of monopodia. The highest number (5.87) was found at the lowest dose (1.5g) of Gaucho. The untreated control produced the highest number of monopodia compared to all chemical treatments and varied significantly. Gaucho treatments significantly affected the rooting length. 5.5g Gaucho produced the longest root (81.25 cm) compared to other doses of Gaucho. monocrotophos treatment produced significantly higher rooting length among the all treatments. Days to 1st flower varied from 49.75-57.0. Gaucho improved earliness and significant variations were found in Gaucho treated plants. Higher the doses lower the days required for the opening of 1st flower. The maximum days required (57.0) in untreated control compared to chemical treatments. Gaucho also favored boll retention in plants. 5.5g Gaucho produced significantly higher number of bolls compared to treatment. The lowest number (11.25) was recorded from the untreated control. Gaucho enhances crop maturity. From table 4.61 it is found that the increasing doses of Gaucho had the significant effect on 1st boll split. 5.50g Gaucho took the lowest time (90.50) for splitting the boll compared to other doses of Gaucho and MON treatment. Untreated control required the highest time (98.50 days) for splitting the bolls. 5.50g Gaucho also exhibited significantly higher boll weight among all treatments. Gaucho had the favorable influence on the ripening of the crop. Increased doses of Gaucho decreased the number of harvest (2.50-3.25). 5.5g Gaucho harvested significantly earlier compared to M and control treatment.

Table 3. Effect of Gaucho on agronomic characters of smooth cotton during 2005-06

Doses Gaucho/kg seed ml/ha	Plant highest (cm)	No of sympodia	No of monopodia	Rooting length (cm)	Days to 1st flower	No of bolls per plant	Days to 1st bolls split	Individual boll wt (gm)	No of harvest
Gaucho.-1.50g	87.25b	14.25b	5.87c	52.50a	52.75c	19.75b	96.00c	3.75b	3.25b
Gaucho.-2.50g	93.00c	15.87c	5.26c	61.25b	52.25c	23.50b	95.00c	3.95b	3.00a
Gaucho.-3.50g	93.37c	19.75d	4.38b	71.75c	51.25b	26.50b	93.50b	4.25c	3.00a
Gaucho.-4.50g	98.12d	22.75e	3.65a	76.00c	50.25a	31.25c	91.50a	4.27c	3.00a
Gaucho.-5.50g	108.87e	27.63f	3.50a	81.25d	49.75a	36.25c	90.50a	4.50c	2.50a
Mon-1120 ml	88.12b	14.12b	5.26c	88.75c	53.25d	22.25b	95.50c	3.75b	3.00a
Control	71.37a	10.88a	6.00cd	57.50a	57.00e	11.25a	98.50d	3.37a	3.50b
LSD(0.05)	2.12	1.58	0.88	7.50	0.67	7.12	1.48	0.41	0.56

- Means followed by same alphabets do not differ significantly (P>0.05) by DMRT
- Small letters indicate comparison within column

Table 4 shows the effect of Gaucho on different agronomic parameters of hairy variety of cotton during 2005-06. Plant height due to Gaucho treatment varied from 87.88-106.75 cm compared to 87.63 cm in monocrotophos and 54.90 cm in control. 5.5g Gaucho gave significantly taller plants among the treatments. No of sympodia ranged from 14.0-27.12 in Gaucho treated plants. The increasing doses of Gaucho increased the number of sympodia and it was significantly higher in 5.5g Gaucho. Sympodia in monocrotophos (15.50) were higher than control (11.87). In case of monopodia, the number decreased with the increasing doses of Gaucho with a range from 3.25-6.87. Control treatment gave the highest number of monopodia (7.00) compared to monocrotophos (6.00) and Gaucho. Statistical differences were found between the treatments.

Rooting length varied from 57.50-85.75 cm in Gaucho treated plants compared to monocrotophos 60.0 cm in monocrotophos and 54.75 cm in the control. The highest length was found in 5.50g Gaucho. The days of 1st flower counted from 50.75-53.50 in Gaucho treated plants compared to 55.0 in monocrotophos and 58.25 in control with significant statistical variations. Boll retention in Gaucho treated plants recorded as 19.50-35.75. Higher doses gave more retention. Monocrotophos produced 22.75 bolls while 11.75 were found in control. Gaucho also enhanced an early maturation of the crop. 1st bolls split required 92.75 days at 5.5g followed by 97.00 days at 1.50g Gaucho. Significant variations were found among the treatments. Individual boll weight was recorded as 3.75-4.70g in Gaucho treated plants compared to 3.72g in monocrotophos and 3.42g in control. 5.5g Gaucho gave the highest boll weight with significant variation. Crop was harvested earlier (2.53-3.0) from all chemical treatments compared to untreated control (3.50).

Table 4. Effect of Gaucho on agronomic characters of hairy cotton during 2005-06

Doses Gaucho/kg seed ml/ha	Plant highest (cm)	No of sympodia	No of monopodia	Rooting length (cm)	Days to 1st flower	No of bolls per plant	Days to 1st bolls split	Individual boll weight (gm)	No of harvest
Gaucho-1.50g	87.88b	14.00b	6.87d	57.50a	53.50b	19.50b	97.00c	3.75b	3.00b
Gaucho-2.50g	91.55b	15.50c	5.87c	66.75c	52.75b	22.50b	95.28b	3.96c	3.00b
Gaucho-3.50g	95.35c	19.12d	4.55b	74.00d	51.50a	26.25c	94.50b	4.37d	3.00b
Gaucho-4.50g	97.62c	23.63e	3.85a	81.25e	51.75a	33.75d	93.00a	4.50e	3.00b
Gaucho-5.50g	106.75d	27.12f	3.25a	85.75f	50.75a	35.75d	92.75a	4.78f	2.50a
Mon-1120 ml	87.63b	15.50c	6.00c	60.00b	55.00c	22.75b	96.00bc	3.72b	3.00b
Control	54.90a	11.87a	7.00e	54.75a	58.25d	11.75a	96.75c	3.42a	3.50c
LSD(0.05)	5.53	1.45	0.78	4.41	1.70	4.26	1.55	0.14	0.42

- Means followed by same alphabets do not differ significantly (P>0.05) by DMRT
- Small letters indicate comparison within column

CONCLUSION

The increased dosages of fertilizers improved plant quality for more insects attack in both treated and untreated control plants. Improvement of agronomic characters of cotton plant was demonstrated due to Gaucho treatment compared to monocrotophos and control.

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