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INFLUENCE OF SOME AGRICULTURAL PRACTICES ON INFESTATION LEVELS OF RICE WITH *CHILO AGAMEMNON* BLES .

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Abstract

The effects of four agronomic practices on rice infestation with chilo agamemnon were investigated, and are summarised as follows :

1- Broadcasted rice was less infested (9.30%) than the transplanted (12.08%). Regardless of the used varieties.

2- Among six transplanting spaces (30x30, 20x30, 20x20, 20x15, 20x10 and 10x10 cm, the narrower the spaces (20x10 and 10x10) the lower infestation (6.02 and 5.81%, respectively).

3. Testing three irrigation systems (continuous flooding, 4 days on + 6 days off and 4 days on + 12 days off) showed that the borer infestation decreased from 11.85 to 8.40% as the water in the field was decreased from continuous flooding to 4 days on + 12 days off.

4- When three levels of nitrogen fertilizer (0,40 and 60 kg/fed) were tested, the borer infestation decreased from 15.25 to 12.70% as the fertilizer level decreased from 60 to 0 kg/fed.

Therefore narrow transplanting space, broadcasting method, low water irrigation and low nitrogenous fertilization are recommended to decrease the rice stem borer infestation in rice fields.

INTRODUCTION

Rice crop is one of the most indispensable food crops in Egypt. It is liable to attack by several pests under field condition. The rice stem borer, *Chilo agamemnon* Bles. is considered one of the major pests.

Entomologists have worked hard to keep insect damage under the economic level. Agronomy is very important item in IPM system that aims at achieving best insect control with least insecticidal use. Agricultural practices are considered very easy, cheap, effective and safe methods for insect control.

In previous studies, the effect of some agricultural practices : harvest date, harvest level and plant trap on the borer infestation, were investigated. This study aims at testing the effects of four other agricultural practices; transplanting space, planting method, irrigation system and nitrogenous fertilization, on the incidence of the rice stem borer infestation in order to find the best application that reduce the insect damage.

MATERIALS AND METHODS

These experiments were carried out at Agr. Res. St., Sakha, Kafr El-Sheikh Governorate from 1991 to 1994 rice season. The randomized complete block design was followed and each treatment was replicated four times. The experiments were sown in mid May and transplanted in mid June with three seedlings per hill.

A. The effect of transplanting space on rice stem borer infestation

For this study, two experiments were conducted during two successive seasons; 1991 and 1992. Giza 180 rice variety was used in this study. The transplanting method was followed. The plot size was 40 m2. The tested planting spaces were 30x30, 20x30, 20x20, 20x15, 20x10 and 10x10 cm between rows and hills, respectively .

B. The effect of planting method on rice stem borer infestation

For this study, two experiments were conducted in 1994 rice season. Two methods of planting; broadcasting and transplanting, were compared for their effect on the rice stem borer. One experiment was directly seeded by hand with pregerminated seeds at the rate of 60 kg per feddan on mid May as a broadcasting method, and the other was sown on mid May and transplanted on mid June as a transplanting method. Six rice cultivators; Giza 175, Gz 4255, Gz 4120. Giza 171, Giza 176 and Reiho, were used for each experiment in 40 m2 plot size.

C. Effect of irrigation system on rice stem borer infestation

Two experiments were carried out for this purpose during 1992 and 1993 rice seasons. Giza 180 rice variety was used. The plot area was 1/50 of feddan. The tested irrigation systems were continuous flooding, 4 days on + 6 days off and 4 days on and 12 days off.

D. Effect of nitrogen fertilizer on rice stem borer infestation

For this target, two experiments were carried out during 1992 and 1993 rice

seasons. Giza 180 rice variety was used. The plot size was 40 m2. The nitrogen fertilizer was used in the form of ammonium sulfate containing 20.5% nitrogen. The tested rates of nitrogen fertilizer were 0, 40 and 60 kg/fed.

From each plot (replication) in each experiment, random samples of 25 hills were taken twice; at 60 days after transplanting for dead hearts and 10 days before harvest for white heads. Total and infested plants were counted for each sample, and the percentage of damage was then calculated. Data were subjected to analysis of variance.

RESULTS AND DISCUSSION

A. Effect of transplanting space on rice stem borer infestation

Table 1 showed the effect of transplanting space on the incidence of the rice borer.

Results indicated that as rice was transplanted at wider spaces (30x30 and 20x30 cm), average damages percentages were higher (11.48 and 9.46%) than at narrower spaces (20x10 and 10x10 cm) where the average of damage percentage were (6.02 and 5.81 %), respectively. There was significant differences between the corresponding damage values of each season. Differences between percentages of damage resulted from 20x20 and 20x15 cm spaces were not significant. It is important to refer that dead heart and white head parameters followed the same trend. This might be explained by the fact that the crowded plots produce less vigorous and tender rice plants which appear less attractive for the borer and consequently less susceptible than in case of the wider spaces. Pathak (1964) stated that tall varieties with bigger stem and wider leaves were more susceptible.

Table 1. Effect of planting space on the rice stem borer infestation.

Space (cm)	Dea heart %		white head %		Damage %		
	1991	1992	1991	1992	1991	1992	Mean
30x30	5.51	5.06	6.36	6.02	11.87a	11.08a	11.48
20x30	4.42	4.24	5.01	5.24	9.43b	9.48b	9.46
20x20	3.33	3.69	4.91	4.83	8.14c	8.52c	8.33
20x15	3.32	3.97	4.48	4.53	7.80c	8.50c	8.15
20x10	2.61	2.81	3.18	3.44	5.79d	6.25d	6.02
10x10	2.10	2.48	3.00	3.04	5.10d	6.52d	5.81

Values followed by the same letter are not significantly different at the 5% level by DMRT.

It can be concluded that crowdness of rice hills in the field decreased the borer infestation as shown by the damage and its parameters. The presented data agree with Israel *et al.* (1962), Tantawi *et al.* (1980) and Isa (1987). They found that rice field with close plant spacing were relatively less infested with rice stem borer than fields with wide spacing .

B. Effect of planting method on rice stem borer infestation

Data presented in Table (2) showed the effect of rice planting method on the borer incidence.

Table 2. Effect of planting method on the rice stem borer infestation.

Variety	Method of planting					
	Broadcasting			Transplanting		
	D.H.%	W.H. %	Damage %	D.H.%	W.H.%	Damage %
Giza 175	5.83	7.01	12.84a	6.71	10.00	16.71a
GZ 4255	5.00	5.15	10.10b	5.00	8.20	13.20b
GZ 4120	4.80	5.18	9.98b	5.70	7.10	12.80b
Giza 171	4.30	5.90	10.20b	6.20	7.20	13.40b
Giza 176	3.90	4.00	7.90c	4.00	5.50	9.50c
Reiho	2.25	2.50	4.75d	3.39	3.50	6.89d
Average	4.35	4.95	9.30	5.17	6.91	12.08

Values followed by the same letter are not significantly different at the 5% level by DMRT. D.H. = Dead heart. W.H. = White head.

Results indicated that planting method significantly affected borer infestation level. Regardless of the used varieties, percentages of damage were lower, as the broadcasting method was followed (9.30%) than in case of using the transplanting method (12.08%). Taking the used varieties in consideration, when the varieties were broadcasted, Giza 175 received the highest damage (12.84%) followed by Giza 171 (10.20%), Gz 4255 (10.10 %), Gz 4120 (9.98%), Giza 176 (7.90%) and Reiho (4.75%) which was the least damaged one. The varieties followed the same order when they were transplanted with the corresponding damage values; 16.71, 13.40, 13.20, 12.80, 9.50 and 6.89%, with significant differences in most cases. It was reported that broadcasted rice received less infestation than the transplanted rice (Bamerjee and Pramanik, 1967).

It is clear that the narrower spaces between hills and/or rows in the broadcasted rice plots, the lower the infestation with the borer. This might be due to the fact that transplanting produces plants which possess, relatively wide leaves, thick

stems, vigorous vegetative growth and low tiller density which appear more attractive for the borer and consequently more susceptible than in the case of broadcasting. Litsinger *et al.* (1978) stated that low tiller density favours damage by stem borers. Low tiller numbers allow a higher population and also, the larger diameter culms under lower tiller are more favourable to stem borer development.

It can be concluded that directly seeded rice showed a lower level of infestation by the rice stem borer than transplanted rice.

C. Effect of irrigation system on rice stem borer infestation

Table 3 showed the effect of irrigation system on the rice stem borer infestation.

Table 3. Effect of irrigation system on the rice stem borer infestation.

Treatment	Dead heart %		white head %		Damage %		
	1992	1993	1992	1993	1992	1993	Mean
Continuous flooding	4.65	4.10	6.05	6.90	10.70b	11.00c	10.85
4 days on + 6 off	3.20	3.00	6.00	6.70	9.20a	9.80b	9.50
4 days on + 12 off	2.29	3.00	6.31	6.20	8.60a	8.20a	8.40

Values followed by the same letter are not significantly different at the 5% level of DMRT.

Data in this table indicated clearly that the borer damage decreased as the water in the field decreased. When the field was flooded continuously, percentages of damage were estimated as 10.7 and 11.0% in 1992 and 1993 seasons, respectively with a mean of 10.85%. The damage decreased to 9.2 and 9.8%, for 1992 and 1993 as the water was removed for six days after every four-days irrigation. The damage reached the lowest levels (8.6 and 8.2% in 1992 and 1993, respectively) by following the system of 4 days on + 12 days off. These results are in agreement with the findings of Karuppuchamy and Uthamasamy (1984) that alternate flooding and draining significantly reduced the incidence of some insects.

With continuous flooding, the borers' microenvironment became slightly cooler and more humid which stimulates the population growth of the insect. This might be explained by the fact that the rice stem borer needs high humidity to lay eggs. This explanation was reported by Israel *et al.*, (1959).

The same Table showed that plants in the tillering stage received lower damage as shown by dead hearts than in the flowering stage as shown by white heads. These results may be due to the broods of rice borer moths which prevail late in the season in agreement with the flowering stage.

D. Effect of nitrogen fertilizer on rice stem borer infestation

Results of the experiments conducted in 1992 and 1993 rice seasons to study the effect of using different rates of nitrogenous fertilization in rice fields are presented in table (4).

Table 4. Effect of nitrogen fertilizer on the rice stem borer infestation.

Treatment N. Fertilizer (kg/fed)	Dead heart %		white head %		Damage %		
	1992	1993	1992	1993	1992	1993	Mean
0	3.40	3.51	7.60	7.39	10.00a	10.90a	10.90
40	3.50	3.78	7.70	8.92	11.20a	12.70a	12.70
60	4.42	5.25	9.78	11.05	14.20b	16.30b	16.30

Values followed by the same letter are not significantly different at the 5% level of DMRT.

Data obtained in 1992 and 1993 indicated that damage in plots treated with higher rate of nitrogen (60 kg/fed.) were significantly higher (14.2 and 16.3 with mean of 15.35%) than in case of 40 kg/fed. (11.2 and 12.7 with mean of 11.95 %) or not treated at all (10.0 and 10.9 with mean of 10.45%), in the two seasons, respectively.

It can be concluded that rice plants treated with low rate of nitrogen were less subjected to borer infestation. These data correspond with the findings of Isreal and Vedamoorthy (1958) who concluded that fertilizers indirectly make plants grow better and in turn increase borer incidence. Fertilizers also increase plant tillers and consequently the foliage causing the production of more egg masses. Fertilizers also increase the softness of the stem, thereby the stem borer damage increases. The previous explanations were confirmed by William and Maximos (1978) and Isa (1987).

As a general conclusion, agricultural practices system including planting in broadcasting method, transplanting in narrower spaces, irrigating in lower water and using lower rates of nitrogen can decrease the incidence of the rice stem borer infestation in rice fields. The effect of this system can be attributed to the production of shorter plants, smaller leaves, harder plant tissues, less tillers per unit area as well as less humidity that make the rice field conditions less attractive to the borer for egg ovipositon, feeding and survival.

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تأثير بعض العمليات الزراعية على مدى الإصابة بثاقبة ساق الأرز فى حقول الأرز

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معهد بحوث وقاية النباتات – مركز البحوث الزراعية .

إلحاقا بثلاثة بحوث سابقة حول تأثير العمليات الزراعية (ميعاد الحصاد ومستوى الحصاد والمصائد النباتية) على الإصابة بثاقبة ساق الأرز ، تم فى هذا البحث المتابعة بدراسة تأثير أربعة عمليات أخرى هى مسافة الشتل، طريقة الزراعة، نظام الرى، وكذلك مستوى التسميد الأزوتى.

وقد دلت النتائج على الآتى :-

١- من بين ست مسافات زراعة تم اختبارها (٣٠ x ٣٠ ، ٣٠ x ٢٠ ، ٢٠ x ٢٠ ، ٢٠ x ١٥ ، ٢٠ x ١٠ ، ١٠ x ١٠ سم)، كانت المسافات الأضيق (٢٠ x ١٠ ، ١٠ x ١٠) هى المرتبطة بالأصابه الاقل (٦,٠٢ ، ٥,٨١٪ على التوالى).

٢- بغض النظر عن الأصناف المستخدمة كانت نباتات الزراعة بدار اقل إصابة (٩,٣ ٪) من نباتات الزراعة شتلا (١٢,٠٨٪).

٣- عند اختبار ثلاثة أنظمة لرى الأرز (غمر مستمر ، ٤ أيام رى + ٦ بدون رى ، ٤ أيام رى + ١٢ بدون)، اتضح أن الإصابة بالثاقبة انخفضت من ١١,٨٥ الى ٨,٤٠٪ عندما انخفضت المياة فى الحقل من غمر مستمر الى انقطاع ١٢ يوم بعد كل ٤ أيام غمر.

٤- عندما تم اختبار ثلاثة مستويات من التسميد الأزوتى (صفر ، ٤٠ ، ٦٠ كجم/ف) ، انخفضت الإصابة بالثاقبة من ١٥,٢٥ الى ١٢,٧٠٪ بانخفاض مستوى التسميد من ٦٠ الى ٤٠ كجم/ فدان.

وهكذا نجد أن مسافات الشتل الضيقة ، الزراعة بدار ، الحد من فترة الغمر ، عدم المغالاة فى التسميد الأزوتى، تعبر توصيات فعالة فى الحد من الإصابة بثاقبة ساق الأرز فى حقول الأرز.