Advances in Life Science and Technology
ISSN 2224-7181 (Paper) ISSN 2225-062X (Online)
Vol.35, 2015
www.iiste.org

Impact of various insecticides and planting dates on the management of maize stem borer *Chilo partellus*

Muhammad Ilyas[1], Nazeer Ahmed[1], Ahmad Zada[2], Javed Rahman[2], Fazal Maula[2], Noor Habib Khan[2], Muhammad Junaid[2] Muhammad Umair[1]
1, The University of Agriculture, Peshawar-Pakistan
2, Agricultural Research Institute, Mingora, Swat-Pakistan

Abstract
Field experiment on the impact of various insecticides and planting dates on the management of maize stem borer *Chilo partellus* in maize crop was conducted at Malakandair farm of The Agricultural University, Peshawar. Maize variety Jalal was raised on three different dates viz. 22nd June, 04 July and 16th July, 2014; and treated with Furadon 3G, Thimet 5G, Ripcord 10EC, Thiodan 35 EC, Karate 25 EC. Results revealed that means for number of healthy plants m^{-2}, infested plants m^{-2}, larvae in stubbles m^{-2}, dead hearts m^{-2}, and grains yield kg ha^{-1} showed significant effects due to insecticides and sowing dates. The number of healthy plants m^{-2} and yield in kg ha^{-1} were highest while the number of infested plants m^{-2}, dead hearts m^{-2} and larvae in stubbles m^{-2} were lowest in the plots treated with Furadon 3G (77.46, 1759.44, 11.63, 9.42 and 3.56) followed by Thimet (75.16, 1643.22, 14.64, 10.34 and 5.00) as compared to other extremes in Control (61.91, 1131.78, 21.48, 17.29 and 10.56). The number of healthy plants m^{-2} and yield in kg ha^{-1} were highest while the number of infested plants m^{-2}, dead hearts m^{-2} and larvae in stubbles m^{-2} were lowest in the plots sown on 22nd June (74.09, 1596.44, 15.20, 10.88 and 5.28) as compared to other extremes in plots sown on 16th July (71.24, 1401.50, 17.13, 13.73 and 7.44 respectively). The sowing date of 22nd June along with the application of Furadon 3G showed significant results for all the recorded parameters as compared to other treatments.
Keywords: Insecticides, Planting dates and Maize Stem Borer

INTRODUCTION

Maize (*Zea mays* L.) ranges third in world's cereals productivity. The origin of maize crop is US and has been domesticated about 7000 years ago. It is used for feed and food but its average productivity is low. Among the crops, maize is versatile having high nutritive value (Chaudhary, 1983). It is relatively short duration crop for the area of high altitude where chilling conditions and snow fall limit the growing period. In Pakistan, maize yield is 3037 kg ha^{-1} and in Khyber Pakhtunkhwa about 1780 kg ha^{-1} (MINFAL, 2009).

Maize stem borer, Chilo partellus Swinhoe (Lepidoptera: Pyralidae) is one of the major biotic constraints in successful maize and sorghum production worldwide (Pingali, 2001; James, 2003), particularly in Asia and Africa (Arabjafari & Jalali, 2007). It has been reported to cause severe losses in maize crop throughout its geographical distribution including Pakistan. This pest attacks all parts of the plant except roots, and causes damage by the destruction of the growing point in the whorl (dead heart), loss of photosynthetic leaf area due to foliar feeding, lodging due to burrowing in the stem, and extensive damage to young kernels due to feeding of larvae from the second and third generations. Damage is critical when the growing points of young plants are completely damaged, when there is extensive lodging due to stem boring, and when second and third generation larvae feed directly on the cob. Yield loss as high as 40% has been attributed to stem borers (Chabi *et al*., 2005).

A number of control methods have been used by the researchers to control the pest but due to heavy infestation and greater damage, chemical control is the most important method. Proper sowing time may enhance germination, establish stand and contribute higher in production by utilization of the resources effectively and suppressing the stem borers as well. Granular formulations of chlorpyriphos and carbofuran were reported effective against the pest by Bhat and Baba (2007). Keeping in view the importance of the crop, the devastating capacity of the pest and the ever dynamic pesticide market, the present research work was initiated to investigate the suitability of some insecticides for effective and safe suppression of Chilo partellus Swinhoe. Furthermore, various sowing dates were used in order to find the most suitable date for control of Chilo partellus Swinhoe in the area.

MATERIAL AND METHODS

An experiment on the "Impact of various insecticides and planting dates on the management of maize stem borer *Chilo partellus*" was conducted on maize variety Jalal at Malakandair farm of Khyber Pakhtunkhwa Agricultural University, Peshawar.

Field Layout:

The seeds were planted on three different sowing dates i.e. first on 22nd June, second on 04th July and third on 16th July, 2014. The row to row and plant to plant distance was kept 75 and 25 cm, respectively. Size of each experimental unit was maintained 4x5 m^2. A buffer zone of one meter width was kept between the experimental units to isolate them from one another. The soil condition was alkaline in nature with a PH value of 6.9 having sandy loam soil texture.

Fertilizer:
Urea, Di-Ammonium Phosphate (DAP) and Murate of Potash (MOP) were applied to the maize field as source of NPK. The rate of NPK for this experiment was 120:60:90 kg ha^{-1}.

Insecticides:
Five insecticides, as shown in table-1, were applied in the experiment. The granular insecticides were broadcasted at the time of sowing while the foliar insecticides were applied with the help of hand operated knapsack sprayer on crop at three leaf stage.

Experimental Design:
The experiment was laid down in RCB design with the split plot arrangements. Sowing dates were assigned to main plots while insecticides were assigned to subplots. All the treatments were replicated three times.

Data collection and parameters of interest:
For the extent of infestation, leaf holes, larval excreta, leaf scratches, dead heart and presence of larvae were used as criteria for infested plants which was then converted into total percent infestation and mean percent infestation for the season. The data on three of the following parameters i.e. healthy plants m^{-2}, dead hearts m^{-2}, and infested plants m^{-2} were recorded 25, 40 and 55 days after germination while the data on parameters numbers of hibernating larvae in stubble m^{-2} and Grain yield (kg ha^{-1}) were recorded after harvesting.

Recorded Parameters:
1. Healthy plants m^{-2}
2. Dead hearts m^{-2}
3. Infested plants m^{-2}
4. Numbers of hibernating larvae in stubble m^{-2}
5. Grain yield (kg ha^{-1})

Data analysis
The data was analyzed using MSTATC package by analysis of variance of factorial randomized complete block design for dates of sowing, with insecticides as split on date of sowing and time interval as split on insecticides. Means were compared using LSD test at 5% level of significance ($P<0.05$).

RESULTS AND DISCUSSION

Impact of sowing dates and insecticides on number of healthy plants m^{-2}
The means for number of healthy plants m^{-2} (table 2) showed significant effect due to insecticides being maximum in plots treated with Furadon 3G (77.46) followed by Thimet 5G (75.16), Ripcord 10EC (74.34), Thiodan 35 EC (72.02), Karate 25 EC (68.22) and Control (61.91), all with statistically significant difference. Maximum number of healthy plants were recorded in plots sown on 22nd June and treated with Furadon 3G that was due to reduced population of maize stem borer (Suhail *et al*., 2000). Kakar *et al*. (2003) reported reduction of infested plants to 4.27% as compared to 15.3% in control by the application of Furadon 3G while Khan *et al*. (1999) reported significant reduction of infested plants due to Diptrex 80 SP infested (12.18%), Actara WS 70 (13.73%) and Confidor WS 70 (13.74%) respectively. The means for number of healthy plant m^{-2} were significantly different on all sowing dates. Maximum number of healthy plants m^{-2} (74.09) were recorded in plots having sowing date 22nd June followed by 04th July (71.24) and 16th July (69.23). Plots sown on 22nd June and treated with Furadon 3G had significantly highest number of healthy plants m^{-2} as compared to minimum in Control plots sown on 16th July, which means adjustment in planting dates can give good results against maize borer infestation (Nwanze and Mueller, 1989). The interaction effect of sowing dates x insecticides showed that maximum number of healthy plants m^{-2} (80.33) was recorded in plots being sown on 22nd June and treated with Furadon followed by plots treated with Thimet (77.46) sown on the same date. These two were followed by the plots treated with Ripcord sown on 22nd June (75.98) and Furadon sown on 04th July having 75.98 and 75.67 numbers of healthy plants m^{-2}, respectively. Lowest numbers of healthy plants m^{-2} 58.05, 63.01 and 64.68 were recorded in Control plots sown on 16th July, 04th July and 22nd June, respectively.

Impact of sowing dates and insecticides on number of infested plants m^{-2}
Significant effect was found for number of infested plants m^{-2} (table 3) due to insecticides being maximum in Control plots (21.48) followed by Karate 25EC (17.68), Thiodan 35EC (16.36), Ripcord 10EC (15.46), Thimet

5G (14.64) and Furadon 3G (11.63), all with statistically significant difference. Khan *et al*., 1999 reported 12.15% infested plants due to maize stem borer in untreated Azam variety of maize. Furadon 3G treated plots had the smallest number of infested plants m^{-2} as compared to the highest in Control. Khan *et al*., 1999 also reported Furadon and Thimet as most effective granular insecticides against maize stem borer. Anwar and Shafique (1987) reported that one application of Furadon is effective in reducing the maize stem borer infestation to 5.86% as compared to 12.84% in Control. Rahman *et al*. (1998) stated that soil application of Furadon plus whorl application 20 days after germination was the most effective treatment against maize stem bore. The means for number of infested plants m^{-2} were significantly different on all sowing dates. Maximum number of infested plants m^{-2} (17.13) were recorded in plots having sowing date 16th July followed by 04th July (16.29) and 22nd June (15.20). By viewing the interaction effect between sowing dates x insecticides presented in table 3, it is obvious that, minimum number of infested plants m^{-2} (11.00) was found in plots being sown on 22nd June and treated with Furadon 3G whereas, maximum infested plants m^{-2} (22.53) were recorded on sowing date of 16th July in control. The results related to the effects of post treatments day intervals are shown in table 4. The means for number of infested plants m^{-2} showed significant effect due to post treatments day intervals being significantly maximum on Day 55 (16.41) of the post treatment and minimum on Day 25 (16.01). The number of infested plants m^{-2} recorded on Day 40 (16.21) of the post insecticide treatments were statistically equal to those recorded on Day 25 and Day 55.

Impact of sowing dates and insecticides on number dead hearts m^{-2}

Table 5 indicated significant effect due to insecticides being maximum in Control plots (17.29) followed by Karate 25EC (14.44), Thiodan 35EC (11.47), Ripcord 10EC (10.81) and Furadon 3G (9.42), all with statistically significant difference. Kakar *et al*. (2003) also reported that various granules studied and checked the maize stem borer with significant difference over the control. Khan *et al*., 1999 observed 7.21% dead hearts that were significantly lower than control. Minimum dead hearts (7.50%) due to Furadon application as compared to all other tested insecticides was also reported by Khan and Amjad 2000. The means for number of dead hearts m^{-2} were significantly different on all sowing dates. Maximum number of dead hearts m^{-2} (13.73) were recorded in plots having sowing date 16th July followed by 04th July (12.28) and 22nd June (10.88). The interaction effect of sowing dates x insecticides showed that maximum numbers of dead hearts m^{-2} was recorded in Control plots being sown on 16th July (19.77) and 04th July (17.31). These two were followed by the plots treated with Karate sown on 16th July and Control plots sown on 22nd June having 16.43 and 14.80 numbers of dead hearts m^{-2}, respectively. Lowest numbers of dead hearts m^{-2} 8.31, and 9.09 were recorded in plots sown on 22nd

June being treated with Furadon and Thimet.

Impact of sowing dates and insecticides on number hibernating Larvae in stubbles m^{-2}

The means for number of hibernating larvae in stubbles m^{-2} (table 6) showed significant effect due to insecticides being maximum in Control plots (10.56) followed by Karate 25EC (7.44), Thiodan 35EC (5.89), Ripcord 10EC (5.56) and Furadon 3G (3.56), all with statistically significant difference. Furadon 3G treated plots had the smallest number of hibernating larvae in stubbles m^{-2} as compared to the highest in Control. Decrease in numbers of larvae in stubbles due to various insecticides was also reported by Khan *et al*., 2004. The means for number of hibernating larvae in stubbles m^{-2} were significantly different in all sowing dates. Maximum number of hibernating larvae in stubbles m^{-2} (7.44) were recorded in plots sown on16th July, followed by 04th July (6.28) and 22nd June (5.28). The interaction effect of sowing dates x insecticides showed that maximum number of hibernating larvae in stubbles m^{-2} (12.00) was observed in control plots being sown on 16th July. While, minimum population of hibernating larvae in stubbles m^{-2} (3.00) was recorded in plots sown on 22nd June treated with Furadon 3G.

Impact of sowing dates and insecticides on grain yield (kg ha^{-1})

The means for yield in kg ha^{-1} (table 7) showed significant effect due to insecticides treated with Furadon 3G (1759.44) followed by Thimet 5G (1643.22), Ripcord 10EC (1611.56), Thiodan 35 EC (1549.67), Karate 25 EC (1283.00) and Control (1131.78), all with statistically significant difference except Thimet and Ripcord that did not differ statistically. Higher grains yield (6.325 tons ha^{-1}) and yield components of maize crop due to Furadon application against maize stem borer was in line with that of Khan *et al*., 1999 and Patel *et al*. (1994) for the reasons of improved plant characters over check (Suhail *et al*. 2000). The means for yield due to sowing dates also showed significant effect and obtained maximum grain yield from the crop sown on 22nd June (1596.44), followed by 04th July (1491.39) and 16th July (1401.50). The interaction effect of sowing dates x insecticides showed maximum grain yield (1885.00 kg ha^{-1}) was recorded in plots being sown on 22nd June treated with Furadon 3G followed by the same sowing date treated with Thimet 5G with a grain yield of 1723.67 kg ha^{-1}. Least grain yield, 1053.33 kg ha^{-1} was recorded in plots sown on 16th July in control plots. Decline in yield due to delayed sowing was also reported by Imholte and Carter (1987). Bauer and Carter (1986) observed that maize seeded four times at 10 days intervals beginning from 1st May did not decrease grain yield. According to Mohyuddin et al., 1981 the yield obtained from early sown crop is statistically higher than late sown and maize stem borer infestation is recorded in the crop.

Table 1: Insecticides and dosages applied

S. No	Trade Name	Technical Name	Dose/ha
1.	Thiodan 35EC	Endosulfan	3087.50 ml
2.	Karate 25EC	Limbda cyhalathrin	617.50 ml
3.	Ripcord 10EC	Cypermethrin	617.50 ml
4.	Furadon 3G	Carbofuran	24.70 kg
5.	Thimet 5G	Phorate	24.70 kg

Table 2: The effect of various insecticides and sowing dates on number of healthy plants m^{-2}

Insecticides	Sowing Dates			Means
	22nd June	04th July	16th July	
Thiodan 35EC	74.85 ^{d}	72.01 ^{f}	69.21 ^{h}	**72.02 ^{D}**
Karate 25EC	71.24 ^{g}	67.42 ^{i}	66.01 ^{j}	**68.22 ^{E}**
Ripcord 10EC	75.98 ^{c}	74.55 ^{d}	72.49 e ^{f}	**74.34 ^{C}**
Furadon 3G	80.33 ^{a}	75.67 ^{c}	76.37 ^{c}	**77.46 ^{A}**
Thimet 5G	77.46 ^{b}	74.79 ^{d}	73.22 ^{e}	**75.16 ^{B}**
Control	64.68 ^{k}	63.01 ^{l}	58.05 ^{m}	**61.91 ^{F}**
Means	**74.09 ^{A}**	**71.24 ^{B}**	**69.23 ^{C}**	

Means followed by different capital letter(s) in extreme row and column are significantly different at 5% level of significance using LSD Test ($P < 0.05$). Rest of the means/values followed by different letters followed by different small letter(s) column is significantly different at 5% level of significance using LSD Test ($P < 0.05$).

LSD value for insecticides = 0.4332 LSD value for interaction = 0.7504 LSD value for sowing dates = 0.7129

Table 3: The effect of various insecticides and sowing dates on number of infested plants m^{-2}

Insecticides	Sowing Dates			Means
	22nd June	04th July	16th July	
Thiodan 35EC	15.18	16.67	17.24	**16.36 ^{C}**
Karate 25EC	16.85	17.67	18.51	**17.68 ^{B}**
Ripcord 10EC	14.14	15.72	16.52	**15.46 ^{D}**
Furadon 3G	11.00	11.70	12.20	**11.63 ^{F}**
Thimet 5G	13.64	14.47	15.79	**14.64 ^{E}**
Control	20.42	21.50	22.53	**21.48 ^{A}**
Means	**15.20 ^{C}**	**16.29 ^{B}**	**17.13 ^{A}**	

Means followed by different capital letter(s) in extreme row and column are significantly different at 5% level of significance using LSD Test ($P < 0.05$).

LSD value for sowing dates = 0.2274 LSD value for insecticides = 0.3216

Table 4: The effect of sowing dates at various post treatments day intervals on the number of infested plants m^{-2}

Post treatments day intervals	Sowing Dates 22nd June	04th July	16th July	Means
Day 25	15.00	16.08	16.95	**16.01 B**
Day 40	15.21	16.29	17.13	**16.21 AB**
Day 55	15.41	15.41	17.32	**16.41 A**

Means followed by different capital letter(s) in extreme column are significantly different at 5% level of significance using LSD Test (P < 0.05).

LSD value for post treatments day intervals = 0.2274

Table 5: The effect of various insecticides and sowing dates on number of dead hearts m^{-2}

Insecticides	Sowing Dates 22nd June	04th July	16th July	Means
Thiodan 35EC	10.39 jk	11.65 ghi	12.37 fg	**11.47 C**
Karate 25EC	12.96 f	13.94 e	16.43 c	**14.44 B**
Ripcord 10EC	9.75 kl	10.86 ij	11.83 gh	**10.81 D**
Furadon 3G	8.31 m	9.45 l	10.51 jk	**9.42 E**
Thimet 5G	9.09 lm	10.48 jk	11.46 hi	**10.34 D**
Control	14.80 d	17.31b	19.77 a	**17.29 A**
Means	**10.88 C**	**12.28 B**	**13.73 A**	

Means followed by different capital letter(s) in extreme row and column are significantly different at 5% level of significance using LSD Test (P < 0.05). Rest of the means/values followed by different letters followed by different small letter(s) column is significantly different at 5% level of significance using LSD Test (P < 0.05).
LSD value for sowing dates = 0.3465 LSD value for insecticides = 0.4900 LSD value for interaction = 0.8488

Table 6: The effect of sowing dates and insecticides on number hibernating larvae in Stubbles m^{-2}

Insecticides	Sowing Dates 22nd June	04th July	16th July	Means	
Thiodan 35EC	5.00	5.67	7.00	**5.89**	**C**
Karate 25EC	6.00	7.33	9.00	**7.44 B**	
Ripcord 10EC	4.67	5.33	6.67	**5.56**	**C**
Furadon 3G	3.00	3.67	4.00	**3.56**	**D**
Thimet 5G	4.00	5.00	6.00	**5.00**	**C**
Control	9.00	10.67	12.00	**10.56**	**A**
Means	**5.28 C**	**6.28 B**	**7.44 A**		

Means followed by different capital letter(s) in extreme row and column are significantly different at 5% level of significance using LSD Test (P < 0.05).

LSD value for sowing dates = 0.5120 LSD value for insecticides = 1.040

Table 7: The effect of sowing dates and insecticides on grain yield (kg ha^{-1})

Treatments	Sowing Dates			Means
	22nd June	04th July	16th July	
Thiodan 35EC	1631.33	1576.00	1441.67	**1549.67** c
Karate 25EC	1425.00	1228.33	1195.67	**1283.00** d
Ripcord 10EC	1675.00	1666.67	1493.00	**1611.56** b
Furadon 3G	1885.00	1700.00	1693.33	**1759.44** a
Thimet 5G	1723.67	1674.00	1532.00	**1643.22** b
Control	1238.67	1103.33	1053.33	**1131.78** e
Means	**1596.44** a	**1491.39** b	**1401.50** c	

Means followed by different capital letter(s) in extreme row and column are significantly different at 5% level of significance using LSD Test ($P < 0.05$).
LSD value for sowing dates = 38.42 LSD value for insecticides = 53.32

Conclusions

It can be concluded that the sowing date of 22nd June along with the application of Furadon 3G, insecticide significantly showed parameters healthy plants m^{-2} and yield in kg ha^{-1}, as compared to other treatments. It is also evident that sowing date of 22nd June and insecticide Furadon 3G showed minimum observations for parameters like, number of infested plants m^{-2}, dead hearts m^{-2} and larvae in stubbles m^{-2}.

Acknowledgements

We are very thankful to the field staff and professors of Khyber Pakhtunkhwa Agricultural University, Peshawar for their precious support and cooperation during the whole experiment. We whole heartedly appreciate their valuable contribution in this particular experiment, without their cooperation this study could not be full filled.

LITERATURE CITED

Anwar, M., and M. Shafique. 1987. Chemical control of rice stem borers with grainular insecticides. Proceedings of Pak. Cong. of Zoology Pakistan. No.7, 83-85.

Arabjafari, K. H. and S. K. Jalali. 2007. Identification and analysis of host plant resistance in leading maize genotypes against spotted stem borer, Chilo partellus (Swinhoe) (Lepidoptera: Pyralidae). Pak. J. Biol. Sci. 10(11): 1885-1895.

Bauer, F. J., and P. R. Carter. 1986. Effect of seeding date, plant density, moisture availability and soil nitrogen fertility in maize kernel breakage susceptibility. Crop Sci. 26(4): 1220-1225.

Bhat, Z. H., and Z. A. Baba. 2007. Efficacy of different insecticides against maize stem borer, Chilo Partellus (Swinhoe) and maize Aphid, Rhopalosiphum maids (Fitch) infesting maize. Pak. Entomol. 29(2): 73-76.

Chabi-Olaye, A., C. Nolte, F. Schulthess and C. Borgemeister. 2005. Abundance, dispersion and parasitism of the stem borer Busseola fusca (Lepidoptera: Noctuidae) in maize in the humid forest zone of southern Cameroon. Bulletin of Entomological Research 95: 169-177.

Chaudhary, A. R. 1983. Maize in Pakistan. Punjab Agriculture Research Coordination Board, University of Agriculture, Faisalabad.

Imholte, A. A. and P. B. Carter. 1987. Planting date and tillage effects on corn following corn. Agron. J. 79(4): 746-751.

James, C. 2003. Global Review of Commercialized Transgenic Crops: 2002 Feature: Bt Maize. ISAAA. Brief No. 29. ISAAA: Ithaca, New York.

Kakar, A. S., K. M. Kakar., M. T. Khan and M. I. Shawani. 2003. Efficacy of different granular insecticides against maize stem borer. Sarhad J. Agric. 19(2): 235-238.

Khan, M. A., W. Yamin, G. S. Shah, I. Ali and M. Liaqatullah. 2004. Effects of different insecticides formulations and doses against maize stem borer in corn fields. Sarhad J. Agric., 20(4): 609-12.

Khan, M. A., A. H. Khan., K. Ahmad and M. S. Baloch. 1999. Control of stem borer by different insecticides in corn hybrid 4208. Pakistan J. Bio Sci. 2(3): 612-613.

Khan, S. M. and M. Amjad. 2000. Chemical Control of Maize Borer (*Chilo partellus* Swin.). Pak. Jour. Biolo. Sci., 3(12):2116-18.

MINFAL, 2009. Ministry of Food, Agriculture and Livestock. Agriculture Statistics of Pakistan. Government of Pakistan Islamabad. P. 18-19.

ISSN 2224-7181 (Paper) ISSN 2225-062X (Online)
Vol.35, 2015

Mohyuddin, A. I., C. Inayatullah and E. G. King. 1981. Host selection and strain occurrence in *Apanteles flavipes* (Cameron) (Hymenoptera: Braconidae) and its bearing on biological control of graminaceous stem borers (Lepidoptera: Pyralidae). Bull. Entomol. Res. 1: 575–81.

Nwanze, K. F. and R. A. E. Mueller. 1989. Management options for sorghum stem borers for farmers in the semi-arid tropics. Int. Workshop Sorghum Stem Borers, Patancheru, 1987, ed. K. F, Nwanze. pp. 105–14. Patancheru, India: ICRISAT.

Patel, G. J., G. N. Patel and M. D. Arha. 1994. Effect of sowing dates on different varieties of rabi maize. Gujarat Agricultural University Research Journal. 20(1): 134-136.

Pingali, P. I. 2001. CIMMYT. 1999-2000. World Maize Facts and Trends. Meeting World Maize Need: Technological Opportunities and Priorities for the Public Sector. CIMMYT, Mexico. D.F. 57p.

Suhail, A., M. J. Arif and M. S. Yazdani. 2000. Comparative efficacy of some insecticides against insect pest complex of maize. Pakistan J. Bio Sci. 3(6): 1052-1053.