SHORT COMMUNICATION

Importance of pod borer in chickpea in some chickpea growing regions of Ethiopia

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Abstract

On-farm survey was conducted for four (1999/00 to 2002/03) successive cropping seasons to determine the damage caused by pod borer (*Helicoverpa armigera*) on chickpea (*Cicer arietinum*) in major chickpea growing regions of Ethiopia. The range of pod damage by *H. armigera* was 0.7 - 12.9%, 1.9 - 16.9%, 1.6 - 19.7%, and 1.1 - 32.7% in 1999/00, 2000/01, 2001/02, and 2002/03, respectively. The extent of pod damage on chickpea by this insect pest was found to vary with altitude. A significant positive association and linear relationship was found between per cent pod damage and weight loss (using 100 seed weight) which indicated that proportion of damaged pods in chickpea closely reflected loss of seed yields.

Key words: Pod borer, Helicoverpa armigera, Chickpea

Introduction

Chickpea (Cicer arietinum) is an important pulse crop grown in different agroecological zones of Ethiopia. It accounts about 18.2% and 17.6% of the total area under pulse production and total grain produce, respectively, in the country (CSA, 2002). Aside from its importance as source of protein to the majority of the population in soil amelioration, and it greatly contributes to the domestic and export market. However, its productivity in the country is low, with an average grain yield of 0.6 t/ha (CSA, 2002), compared to in yields other chickpea producing countries. In Ethiopia pod borer. Helicoverpa armigera is considered to be a major pest of chickpea and is reported to cause substantial yield losses (Geletu 1980, DZARC 1984, Asfaw et al. 1994, Geletu et al. 1996). But the extent of pod damage and yield loss in the major chickpea growing areas have not been studied Geletu (1993) reported up to 80% pod damage while Hailu et al. (1994) reported complete crop failure and decline of chickpea production area due to pod borer problem. Thus, the objective of this study was to assess the actual pod damage level caused by pod borer on chickpea and the associated yield loss in major chickpea growing regions of Ethiopia.

Materials and Methods

Farmers' chickpea fields were surveyed by randomly selecting a sample of 20 chickpea plants at an interval of 5–10 km in each field along a crossed diagonal line. The survey time coincided with the maturity of the crop (during December and February). To determine per cent pod damage, pods were stripped off from the sample plants in the laboratory and pods damaged by *H. armigera*, and those that were not, were counted. Pods damaged by *H. armigera* had characteristic round holes and the seed is mostly completely devored. The percentage of damaged pods and the mean were calculated. In addition, soil type, type of crop adjacent to and previous crop (by interviewing farmers), and the altitude (using altimeter) of each sampled farm were recorded.

Results

Extent of pod damage

Pod damage by *H. armigera* was mostly variable from field to field, district to district and season to season. The range was 0.7 - 12.9%, 1.9 - 16.9%, 1.6 - 19.7%, and 1.1 - 32.7% per plant in 1999/00, 2000/01, 2001/02, and 2002/03 cropping seasons, respectively. Table 1 summarizes the extent of pod damage recorded in different chickpea growing districts. In Moretna Jiru District of North Shewa Zone, central Ethiopia, the incidence of H. armigera was generally low, perhaps due to the higher altitude and the frequent occurrence of frost in that area. In 2001/02and 2002/03, however, a relatively high percentage of pod damage was observed in a single farm in Woyra Amba area (22.6%) and in Enewary area (19.7%). Although the pest damage was recorded in the Sheno. Deneba, Aleltu and Sendafa areas of this Zone, the extent of damage was relatively minimal. In east and west Shewa zones, central Ethiopia, except in Akaki District, the pest damage increased year after year. On the contrary, in Akaki District, the extent of pod damage tended to decline after the 2000/01 crop season. The pattern of incidence of pod borer in Fogera District of south Gonder Zone, northwest Ethiopia, was similar to that of Akaki District. Whereas in Yilmana Densa District of West Gojam, northwest Ethiopia, the extent of pods damaged by pod borer was found to be relatively constant.

Association of Altitude

The association of altitude with the extent of pod damage is depicted in Figure 1. Although the percentage of damaged pods due to pod borer correlated negatively with altitude, chickpea fields that were located at an altitude of ≥ 2300 m had relatively low pod damage. Whereas, fields located at an altitude of 2000m and lower had average damaged pods than those at an intermediate altitude (2000–2300 m). The number of damaged pods in chickpea fields at intermediate altitude were the highest in all the survey seasons.

Discussion

The study revealed that the extent of pod damage by H. armigera varied with locations and seasons. In the past H. armigera was not recorded on chickpea in some localities of North Shewa Zone, particularly in the Sendafa, Aleltu and Sheno areas (DZARC 1994). The pest was also found to cause damage in the Debre Tsige and Dejen areas (Table 1), where chickpea is a recently introduced crop. Moreover, the overall damage caused by pod borer appeared to increase from year to vear (Table 1) suggesting that the importance of the pest is increasing. The wider ranges of pod damage from field to field, district to district and season to season, suggests the possible influence of location and agro-climatic factors across fields, districts and seasons, both on the crop exposure to *H. armigera* and the pest population buildup. In some localities of Yilmana Densa, northwest Ethiopia, as

Zone	District(s)	Yield Estimated – (q)*	Per cent pod damage (mean ± SE)				
			1999/00	2000/01	2001/02	2002/03	Mean
North Shewa	Moretna Jiru	17,617.53	1.6 ± 0.7 (6)	2.6 ± 0.6 (3)	11.8 ± 5.6 (5)	11.1 ± 7.5 (4)	6.77
	Aleltu	18148.20	-	-	4.2 ± 0.0 (2)	1.1 ± 0.43 (3)	2.67
	Deneba	NA	1.94 ± 1.4 (3)	4.5 ± 2.8 (2)	-	-	3.21
	Sheno	NA	1.0 (1)	-	-	-	1.02
	Debre Tsige	NA	-	-	6 - 0	1.58(1)	1.58
East Shewa	Minjarna Shenkora	19,022.29	2.1 ± 0.4 (4)	4.2 ± 2.2 (5)	10.8 ± 3.15 (3)	16.1 ± 1.7 (3)	8.29
	Lome	18,121.25	-	-	6.5 ± 3.08 (5)	8.4 ± 2.76 (5)	7.45
	Gimbichu	39,800.90	-	-	7.8 ± 2.02 (4)	8.8 ± 6.1 (7)	8.31
	Adaa	43,706.64	-	6.9 ± 1.8 (5)	11.6 ± 4.12 (8)	13.6 ± 4.59 (8)	10.66
	Akaki	50,286.44	6.5 ± 3.9 (4)	12.7 ± 2.9 (10)	9.9 ± 3.36 (12)	8.9 ± 2.76 (9)	9.50
West Shewa	Becho	32,499.81	8.4 ± 3.66 (10)	8.5 ± 3.5 (7)	13.2 ± 4.6 (11)	20.4 ± 8.6 (13)	12.64
East Gojam	Enemay	42,278.72	2.0 ± 0.5 (9)	4.7 ± 3.4 (4)	3.1 ± 0.85 (5)	6.4 ± 3.41 (3)	4.06
	Dejen	16,474.27	1.0 (1)	6.4 (1)	8.9 ± 8.04 (3)	3.0 ± 1.39 (2)	4.85
	Debre Work	NA	-	4.6 ± 1.3 (2)	7.8 ± 0.35 (6)	4.3 ±1.81(7)	5.56
West Gojam	Yilmana Densa	10,978.08	-	6.9 (1)	5.1 ± 2.43 (3)	6.9 ± 2.16 (3)	6.30
	Bahirdar Zuria	7,306.62	-	-	-	5.27 ± 0.41 (2)	5.27
South Gondar	Fogera	34,254.70	-	9.2 ± 3.1 (5)	6.9±2.1 (5)	4.9 ± 0.3 (2)	6.99
Over all Mean		-	3.1	6.5	8.3	8.0	_

Table.1 per cent pod damage in chickpea due to *Helicoverpa armigera* in some localities of Ethiopia

= Source: CSA (2002)

"NA= Not Available

Note: figures in parentheses indicate the number of sampled chickpea fields

high as 99% pod damage and high incidence of *H. armigera* in lower altitude (≤ 2000 m) areas have been reported (AARC 2002). In the current study, however, *H. armigera* was found to be more important in mid-altitude areas than with low or high altitude chickpea growing zones. This might be attributed to the limited area covered in the previous (AARC 2002).

When per cent pod damage (as dependent variable) was regressed on altitude, the R^2 value of 0.098 was obtained, indicating that altitude per se contributed to only 9.8% of the variation in extent of pod damage. Thus, the

influence of altitude on pod damage may be due to its effect on temperature, vegetation composition or the associated cultural practices followed by farmers, which in turn might influence the incidence and subsequent damage on chickpea by this insect pest. There are supportive reports by Gledhill (1982) that *H. armigera* is more prevalent in the warmer of environment with monthly mean temperature about 15 °C than in the cooler uplands in South Africa. Besides, who found reduced activity of this pest in Tanzania in areas where the temperature is \leq 7–10 °C Reed et al. (1987).



Figure 1. The effect of altitude on the magnitude of pod damage in chickpea by *Helicoverpa* armigera



Figure 2. The relation between mean percent pod damage and estimated weight loss using 100 seed weight

Since chickpea bears mostly one seed per pod, attempt was made to convert per cent pod damage to weight loss using randomly selected 100 seeds from each sample. A highly significant (p < 0.001, n = 72) positive association and linear relationship was evident between per cent pod damage estimated weight loss (g) when and regressed as independent and dependent variable, respectively (Figure. 2). In this analysis, R² value of 0.963 was obtained, indicating that 96.3% of the variation in seed weight loss is attributed to the variation in per cent pod damage. Thus, in chickpea the proportion of damaged pods closely reflects loss of seed yields and, hence, per cent pod damage can be taken directly as weight loss if the sample is fairly representative of the sampled field. This is in agreement with the views of Lal et al (1985) and van Emden et al. (1988). Hence, this insect pest causes more economic damage in east and west Shewa Zones of central Ethiopia than in the other chickpea growing areas. However, it is possible that the survey data could under-estimate the yield loss as indicated by Bhatnagar et al. (1982) and Reed et al. (1987) that the damage caused by this pest by feeding on the foliage, buds and flowers could also reduce the number of pods bore by the plant, which mostly remains unaccounted for the loss.

Acknowledgment

The author wishes to acknowledge Ato Mekasha Chichaybelu, the initiator of this activity and Ato Assefa Kebede for his assistance in data collection.

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