

THE OCCURRENCE OF ECONOMICALLY IMPORTANT MAIZE PESTS IN SOUTH-EASTERN POLAND

FRANCISZEK LISOWICZ

Institute of Plant Protection, Local Experimental Station,
Langiewicza 28, 35-101 Rzeszów, Poland

Accepted: June 4, 2001

Abstract: The paper presents results of studies on the occurrence and economic importance of maize pests: european corn borer (*Ostrinia nubilalis* Hbn.) and frit fly (*Oscinella frit* L.) (conducted in 1977–2000) as well as aphids (*Aphididae*) and thrips (*Thysanoptera*) (in 1982–1983, 1985 and 1988–2000).

Key words: corn, european corn borer, frit fly, aphids, thrips, occurrence and economic importance, south-eastern Poland

I. INTRODUCTION

The most important maize pests in southeastern Poland are: the european corn borer (*Ostrinia nubilalis* Hbn.), frit fly (*Oscinella frit* L.), aphids (*Aphididae*) and thrips (*Thysanoptera*) (Lisowicz 1996; 1999; 2000). In this connection, long-term studies have been carried out on their occurrence on that crop plants as well as on the yield losses resulting from their feeding.

II. MATERIAL AND METHODS

The studies were performed at Mikulice Plant Breeding Station near Przeworsk during the following years and on the following maize hybrids: 1977–1980 LG-5, 1981–1984 Kb 270, 1985–1995 KLG 2210, 1996–1999 Ola and 2000 Limko.

1. European corn borer

In the first decade of September during the years 1977–1993 the inspection was made on the trial plots and production plantations of the Station for the presence of european corn borer caterpillars and plant damages. However, since 1994, when this pest occurrence was recorded for the first time in south-eastern Poland, detailed analysis have been carried out. By the end of August or in the first decade of September, when plants were at development stage 83 (silo maturity, Siódmiak 1990) the percentage of damaged plants were calculated. Shortly before maize harvest, when plants were at developmental stage 87 (threshing matu-

riety) the percentage of broken stems below cob setting was determined. Further successive 50 plants \times 4 in plot experiments and 100 plants per row in 4 places on the production plantations were examined.

2. Frit fly

Studies on the frit fly occurrence and its harmfulness to maize were conducted in the years 1977–2000. Fifty successive plants \times 4 were examined in detail at the time, when injuries resulting from larval feeding of the pest spring generation were the best visible, i. e. in the period of the 8th leaves development (developmental stage 26). The performed analyses have estimated the per cent of injured plants and seed yield losses. Yield losses were assessed by the author's own methods. In 1977–1985, a three-grade scale of plant injuries was used (Lisowicz 1979), whereas in 1986–2000 – a four-grade scale was applied (Lisowicz 1996).

3. Aphids and thrips

Studies on the population dynamics of aphids and thrips were carried out in the years 1982–1983, 1985 and 1988–2000. The average number of these pests per plant was established by calculating all living specimens at, on the average, 7 day-intervals, initially until developmental stage 53 (visible tassel top) on 20 and later (until the end of maize vegetation) on 10 random plants.

III. RESULTS AND DISCUSSION

1. European corn borer

As a result of inspection undertaken in the years 1977–1993, no european corn borer occurrence was found on maize. The presence of the pest caterpillars and plant injuries were found in 1994 (Lisowicz 1996). During the next years the intensity of that pest occurrence continued to increase (Tab. 1). That involved also increased yield losses, both direct (seed diminishing and cobs remained in the field during harvest, which were crushed by combine wheels) and indirect (clearing a way for fungal spores and bacteria to penetrate plant tissues, which resulted in disease intensity increase).

Table 1

The occurrence of european corn borer on maize in Plant Breeding Station Mikulice in 1994–2000

Year			1994	1995	1996	1997	1998	1999	2000
Experimental field	% of plants	injured	2.7	15.8	15.3	43.1	61.8	63.2	75.3
		brocken below cob	0.0	0.5	1.0	4.5	10.5	9.6	3.4
Production plantation	% of plants	injured	0.5	3.5	5.3	39.0	48.6	50.2	62.5
		brocken below cob	0.0	0.0	0.5	3.0	6.5	6.2	2.1

2. Frit fly

Percentages of maize plants injured by spring generations of the frit fly in 1977–2000 are presented in Fig. 1, and losses of seed yields caused by that pest are summarised in Fig. 2. Plants injured by this pest, mostly to a slight degree, were not numerous in 1993, 1996 and 1997 and constituted from 1 to 2%, whereas in 1981, 1983, 1988 and 1990 the recorded injured plants constituted over 60%. The average per cent of injured plants in the period of 23 years of the studies amounted to 35.8. The lowest (insignificant) losses in the seed yield were found in 1993, 1996, 1997, 1988 and in 2000, while the highest losses (from 15 to 33%) were noted in 1983, 1984, 1985, 1988, 1990, 1992 and in 1995. The average loss of maize seed yields caused by feeding of frit fly larvae in the years 1977–2000 was 9.5%. The correlation coefficient between the percentage of injured plants and seed yield loss was highly significant and reached the value of 0.88. Simultaneously, the influence of farm habitat on the level of these losses became evident. In the years, when conditions (especially thermal and moisture ones) during the vegetation season of maize, particularly at the time when plants developed their 4th to 6th leaves (developmental stages 22–24), were favourable to plant growth and development, the frit fly harmfulness was lower, because rapidly growing plants got rid of larvae within a few days. In the weather was cold or drought occurred during that period, plants grew slowly and larvae fed longer. Then losses of maize yields were considerably higher.

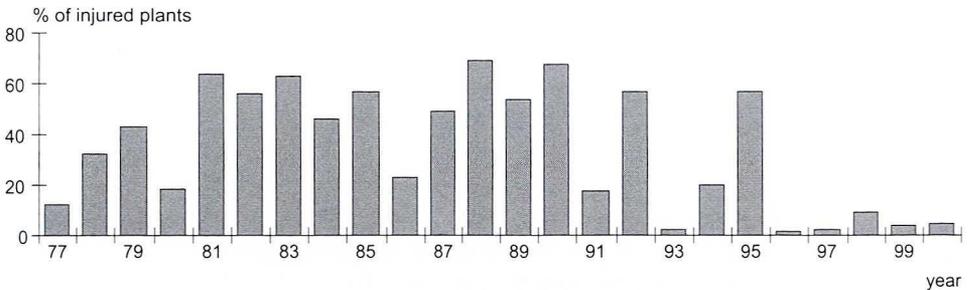


Fig. 1. Percentage of injured plants by the frit fly in Plant Breeding Station Mikulice in 1977–2000

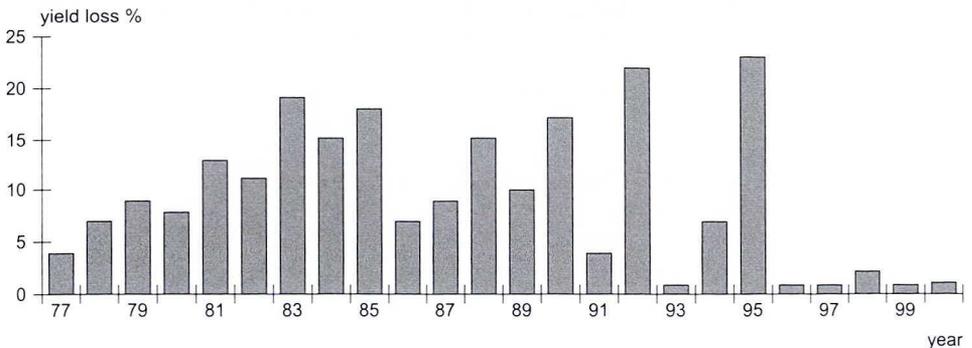


Fig. 2. Grain yield losses of maize caused by the frit fly in Plant Breeding Station Mikulice in 1977–2000

Numerous plant injuries resulting from feeding of frit fly larvae caused an increase of infestation with pathogens, particularly with the common smut of corn (*Ustilago zea* / Beckm. / Unger). This phenomenon particularly manifested itself in the years 1978–1982, 1988–1990 and 1994–1995.

3. Aphids and thrips

The population dynamics of aphids on maize in the years 1982–1983, 1985 and 1988–2000 is presented in Fig. 3. Very large differences were noted in the intensity of aphid occurrence in particular years depending on meteorological conditions and on the size of aphidophagous predaceousness (*Coccinellidae*, *Syrphidae* et al.). The highest numbers of these insects from 300 to 454 individuals per plant were found in the years 1982, 1989, 1990, 1996 and 2000. In the period of maize vegetation, aphids occurred in the numbers from 1 to a maximum 3, most frequently on the first days of July, when plants were at developmental stages 26–31 (with 11 and more developed leaves – 1 node); they also occurred in August and in some years also in September or at the beginning of October.

Two aphid species mainly occurred on maize. They were *Rhopalosiphum padi* L. and *Metopolophium dirhodum* Walk. In some years the latter dominated in June and July in some years, whereas *Rhopalosiphum padi* L. dominated in others in August and September the number of *Metopolophium dirhodum* Walk. aphids, gradually decreased, while the number *Rhopalosiphum padi* L. increased.

Injuriousness of these aphid species to maize was not similar. *Metopolophium dirhodum* Walk. aphids, which fed on the leaf surfaces and other plant organs were frequently thrown down by pouring rains and strong winds, and fall an easy prey to aphidophages. *Rhopalosiphum padi* L. aphids feeding in more and more numbers not only on the leaf surfaces, but as plant grow, also on the inner surfaces of leaf sheaths and in the cob coverage leaves, were better protected against a negative influence of environmental factors and caused considerably larger injuries to plant tissues.

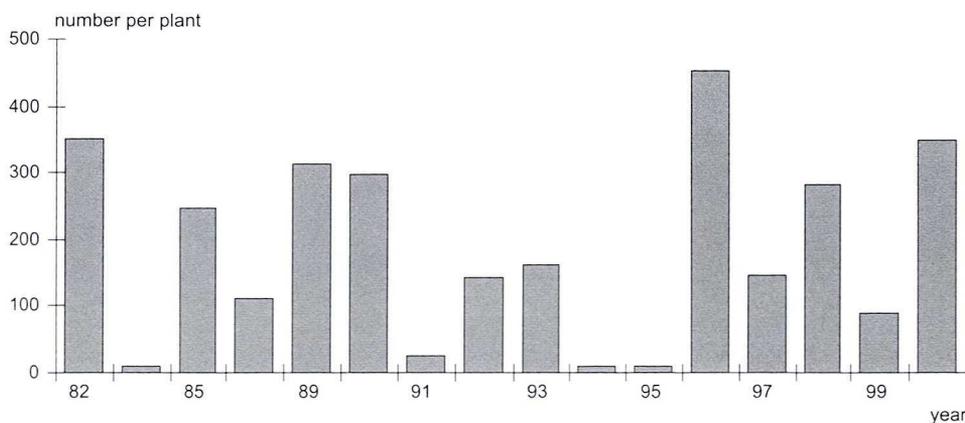


Fig. 3. The occurrence of aphids on maize in Plant Breeding Station Mikulice in 1982–1983, 1985 and 1988–2000

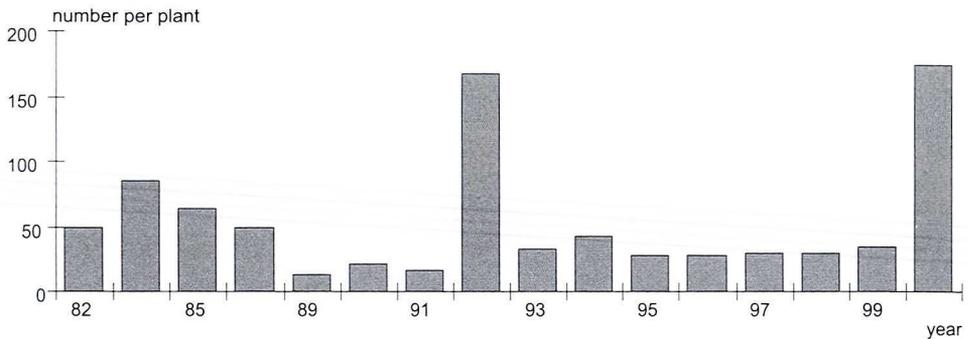


Fig. 4. The occurrence of thrips on maize in Plant Breeding Station Mikulice in 1982–1983, 1985 and 1988–2000

Direct aphid harmfulness to maize was small. Losses of seed yield caused by this species were mostly not significant (Lisowicz 1996), whereas their indirect harmfulness consisting in making a way for fungi and bacteria to penetrate plant tissues was considerably higher, especially in 1996 (Lisowicz 1997) as well as in 1982, 1989, 1990, 1997, 1998 and 2000.

The occurrence of thrips on maize in 1982–1983, 1985 and 1988–2000 is presented in Fig. 4. The number of these insects was considerably lower than that of aphids. Fluctuations in their intensity in particular years were also smaller. The largest thrip number, 166 individuals per plant, was found to occur in year 1992 and 175 in 2000, when these insects found good conditions for their development on maize plants. The least numbers of these pests fed on maize in 1989. Their direct and indirect harmfulness to plants was also significantly lower than that of aphids, but thrips also contributed to losses in maize yields.

IV. CONCLUSION

The most important maize pest causing the highest losses in this plant yield on the area of south-eastern Poland in the period from 1977 to 1995 was the frit fly, whereas during the last years (1996–2000) it has also become the european corn borer. Harmfulness (especially indirect) of aphids was also significant, while that of thrips was lower. It has been estimated that total losses in maize seed yields caused by pests in south-eastern Poland constitute about 15%.

V. REFERENCES

1. Lisowicz F. 1979. Ploniarka zbozówka jako szkodnik kukurydzy. Materiały 19. Sesji Nauk. Inst. Ochr. Roślin: 315–333.
2. Lisowicz F. 1996. Teoretyczne i praktyczne podstawy zastosowania metod integrowanych w ochronie kukurydzy przed szkodnikami. Prace Nauk. Inst. Ochr. Roślin 36 (1/2): 5–46.
3. Lisowicz F. 1997. Wzrost zagrożenia plonów kukurydzy w Małopolsce przez niektóre choroby i jego przyczyny. Prog. Plant Protection/ Post. Ochr. Roślin 37 (2): 265–267.

4. Lisowicz F. 1999. Badania nad terminami chemicznego zwalczania omacnicy prosowianki (*Ostrinia nubilalis* Hbn.) na kukurydzy. Prog. Plant Protection/ Post. Ochr. Roślin 39 (2): 490–492.
5. Lisowicz F., Jaworowski S. 2000. Badania nad łącznym zwalczaniem mszyc (*Aphididae*), przyłżeńców (*Thysanoptera*) i omacnicy prosowianki (*Ostrinia nubilalis* Hbn.) na kukurydzy. Prog. Plant Protection / Post. Ochr. Roślin 40 (2): 492–494.
6. Siódmiak J. 1990. Metodyka prowadzenia doświadczeń odmianowych z kukurydzą pastewną. COBORU Słupia Wielka. Załącznik 3.

Franciszek Lisowicz

WYSTĘPOWANIE I ZNACZENIE GOSPODARCZE SZKODNIKÓW KUKURYDZY W POŁUDNIOWO-WSCHODNIEJ POLSCE

STRESZCZENIE

W wyniku przeprowadzonych wieloletnich badań stwierdzono, że najważniejszymi szkodnikami kukurydzy w południowo-wschodniej Polsce są: omacnica prosowianka (*Ostrinia nubilalis* Hbn.), ploniarka zbożówka (*Oscinella frit* L.), mszyce (*Aphididae*) i przyłżeńce (*Thysanoptera*).

Występowanie w tej części Polski omacnicy prosowianki na kukurydzy odnotowano po raz pierwszy w 1994 r. W następnych latach, a szczególnie w 1997, 1998, 1999 i 2000 r., nasilenie i szkodliwość tego agrofaga rosły bardzo szybko i obecnie jest on najważniejszym szkodnikiem kukurydzy na terenie województw: lubelskiego i podkarpackiego.

Procenty roślin uszkodzonych przez ploniarkę zbożówkę oraz straty w plonach ziarna kukurydzy powodowane przez larwy tej muchówki były w poszczególnych latach bardzo zróżnicowane i osiągnęły (średnio za lata 1977–2000) odpowiednio: 35,8% i 9,5%. W latach 1977–1995 owad ten był postrzegany jako najważniejszy szkodnik kukurydzy w południowo-wschodniej Polsce.

Występowanie mszyc i przyłżeńców w latach badań było znacznie zróżnicowane. Szkodliwość bezpośrednia tych owadów dla kukurydzy była niewielka, natomiast szkodliwość pośrednia, polegająca na ułatwianiu wnikania do tkanek roślin zarodnikom grzybów i bakteriom była w niektórych latach znaczna.