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Sugar Beet Pests in the Area of Shumen

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Abstract: *Identification of insect pest species and assessment of their population density are the first steps in the insect management program. Insect species in the area of Shumen were monitored for a period of two years (2012-2013) in experimental and commercial fields where sugar beet was grown in rotation with other plants. The pest species were identified and their density measured. Insects were counted in soil samples (beet weevils, click beetles, wireworms); platforms were used for beet flea beetles; aphids, tortoise beetles and moths were counted by visual examination of the plants and in the lab. Fourteen insect species from six families were found to infest the sugar beet crops in the area of Shumen. The most numerous and damageable pests during sugar beet early growth stages were the wireworms, owlet moths larvae, beet flea beetles and beet weevils. The number of wireworms was greater in fields where sugar beet was planted alternatively after corn and sorghum.*

Keywords: *sugar beet, pests, monitoring, phenophase, species identification*

1. INTRODUCTION

Sugar beet insect management depends firstly on identification of the pest species infesting and stressing the plants and then studying their lifecycle specificities, the degree of damage they cause on the crops and what options are there for control. Proper insect management has provoked many researchers during the past. In 1974, the German authors Keinkowski and Uuhle published detailed description of the common sugar beet pests and the damage they cause. The authors published also an album with pictures of the pests. Schufle (1982) and Heitefuss et al (1984) continued their work by studying the area of Frankfurt on Main in Germany. These authors described thoroughly the morphology, biological characteristics, and degree of damage beet weevils, owlet moths, beetles, flea beetled, and moths cause. In Bulgaria, the morphology, occurrence, lifecycle, degree of damage and control of the pests have also been researched. In 1977, during an international conference in Budapest, Romania Varbanov presented a plant protection research concerning the cultivation of commercial sugar beet in Bulgaria which described three of the most damageable pests – beet moths, tortoise beetles and weevils. In 1989 Deleva et al raised the awareness within the sugar beet industry about the presence of insect pests. They warned of possibly 22 pest species threatening the sugar beet crops, among which three click beetles, four weevils (three sugar beet weevils and one corn weevil that can feed on sugar beet plants), flea beetles, owlet moths, aphids and moths.

The relatively slow initial growth stages and the long vegetation period make the sugar beet more susceptible to the occurrence and attack of large number of pests. In favorable conditions, these pests can often destroy the whole culture. Regarding these issues and the fact that sugar beet is a major contributor to the sweetener industry, this study focuses on monitoring of sugar beet pests in the area of the Agriculture Institute of Shumen.

2. MATERIALS AND METHODS

Experimental fields and commercial fields belonging to the Agriculture Institute of Shumen include lands from villages near Shumen (Tsarev brod, Velino and Marash) where sugar beet is grown on a crop rotation principle with other cultures. In 2012-2013 the population density of insect pests was measured in the fields after harvesting the previously planted crop and before planting the sugar beets. Soil samples were excavated by digging 50x50x50cm pits. The number of plots was determined based on the size of the experimental field but a minimum of 25 plots/da was settled. The content and the number of the pest species during the vegetation period of the sugar beet were determined by visual

examination of plants (four repetitions with 100 plants) repeated every 20-25 days (Popkovoy, 1987). Aerial insects were collected with butterfly nets. The species identification and number were determined in laboratory conditions.

3. RESULTS AND DISCUSSION

The sugar beet pest species identified in the researched fields are presented in Table 1. For the study period, 14 types of insect pests species were found, related to 6 families: 1. *Elateridae* (click beetles and their larvae called wireworms): lined click beetle (*Agriotes lineatus L)* and common click beetle (*Agroties sputator L*); 2. *Chrysomelidae* (leaf beetles): beet flea beetle (*Chaetocnema concinna Marsh),* southern flea beetle (*Chaetocnema breviskula Fald),* tortoise beetle (*Cassida nebulosa)* and gold-striped tortoise beetle (*Cassida nobilis*)*;* 3. *Curculionidae* (weevils): common beet weevil (*Bothynoderes punctiventris Germ*.), grey beet weevil (*Tanymecus palliates F*.) and black beet weevil (*Psalidium maxillosum F*.); 4. *Noctuidae* (owlet moths): cabbage moth (*Mamestra brassicae),* bright-line brown-eye (*Lacanobia oleracea)* and sylver Y (*Authographa gamma*); 5. *Aphididae* (aphids): black bean aphid (*Aphis fabae Skop)* and green peach aphid (*Myzus persicae*); 6. *Gelechiidae* (twirler moths): beet moth (*Gnorimoschema ocellatella*).

Table1. *Sugar beet insects in Tsarev brod, Velino and Marash (2012-2013)*

№	Pests	Economic threshold (ET)	Pest infestation per growth stage		
			sowing to leaf rosette	leaf rosette to root formation	root formation to maturation
1.	*Agriotes lineatus*	5 larvae/m^2	+	–	–
2.	*Agriotes sputator*	5 larvae/m^2	+	–	–
3.	*Chaetocnema concinna Marsh*	3-5 larvae/m^2	+	–	–
4.	*Chaetocnema breviskula Fald*	3-5 larvae/m^2	+	–	–
5.	*Bothynoderes punctiventris Germ*.	2 mature insects/m^2 or 40-50% leaf mass damage	+	–	–
6.	*Tanymecus palliates F*.	2 mature insects/m^2 or 40-50% leaf mass damage	+	–	–
7.	*Cassida nebulosa*	1-2 mature insects/m^2 in dry conditions; 2 mature insects/m^2 in rainy weather	+	–	–
8.	*Cassida nobilis*	1-2 mature insects/m^2 in dry conditions; 2 mature insects/m^2 in rainy weather	+	–	–
9.	*Aphis fabae*	2-5% plant infestation	–	+	+
10.	*Myzus persiacae*	2-5% plant infestation	–	+	+
11.	*Mamestra brassicae*	over 10% leaf mass damage	–	+	+
12.	*Autographa gamma*	over 10% leaf mass damage	–	+	+
13.	*Gelechiidae*	over 10% leaf mass damage	–	+	+
14.	*Gnorimoschema ocellatella*	over 12% leaf mass damage	–	+	+

All pests had high population density and caused serious damage on the sugar beet crops (Table 2), although some of them were not typical for the plant (carnivores) while others were specific only for the sugar beet. The wireworms were widely spread among the sugar beet crops especially in fields where corn and sunflower plants were previously planted. The wireworm larvae inflict serious damage to the sugar beet well after germination by feeding on the seeds, the roots of the seedlings and on the mature beets until the formation of rosette of leaves. The larvae in this period had estimated density of over 5 larvae/m^2. The conducted excavations showed that the density of wireworms in all

plot samples was close to the economic threshold (ET) and depending on the climate conditions and mostly on the soil moisture, there is a risk of great damage to the sugar beet crops. At this density the crops are seriously endangered and spraying with proper insecticides is economically justified. The highest population density of the wireworms was measured after corn and sorghum were grown the prior year (7-8 larvae/m^2 for both cultured). The measured wireworm population densities after different the prior year crops are shown in Table 2. The lowest wireworm density is after barley (4 -5 larvae per /m^2) and wheat (4-6 larvae/m^2). These results lead to the conclusion that sugar beet crops planted after corn or sorghum would be exposed to a greater risk of wireworms attack and damage.

The beet flea beetle and the southern flea beetle infested the sugar beets in the initial growth stages. Population density of over 3-5 larvae/m^2 (ET) requires appllication of insecticides. The culture specific spesies from class *Curculionidae* (common beet weevil and gray beet weevil) and tortoise beetles from class *Chrysomelidae* also infested the sugar beets after germination untill the leaf rosette formation. The ET for these pests is over 1-2 mature insects/m^2. As Table 1 shows, after the stage of leaf rosette formation until the root reached harvestable size, the sugar beets were attacked by carnivore insects (owlet moths and aphids), as well as crop specific beet moths. Their infestation severely injures the leaves, which reduces the nutrient flow downward to the root.

Table2. *Wireworm population density depending on crop rotation (measured before planting the sugar beet)*

Prior year crop	2012		2013		Average larvae/m^2
	period	larvae/m^2	period	larvae/m^2	
Wheat	25.09 - 01.10	7.5	20.09 -30.09	6.0	6.4
Barley	25.09 - 1.10	6.0	20.09 - 30.09	5.5	5.4
Corn	20.10 - 05.11	8.5	25.10 - 10.11	9.0	8.7
Sorghum	20.10 - 05.11	7.7	25.10 - 10.11	8.0	7.8
GD - 5%		2.07		2.17	
GD - 1%		3.87		3.98	
P %		0.76		0.78	

4. CONCLUSION

In 2012 and 2013, 14 sugar beet insect species (related to four orders and six families of class Insecta) were found were found to infest the sugar beet crops in the area of Shumen (including land of Tsarev brod and other villages).

The most numerous and damageable pests in the early sugar beet growth stages (from germination to leaf rosette formation) were wireworms, owlet moths larvae, beet flea beetles and weevils.

Planting sugar beet in rotation and immediately after corn and sorghum could cause a high degree of damage to the sugar beet crops since the measured pest population density of wireworms was greater after these two cultures were planted in the same fields.

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