Almaši et al.:
BOLESTI, ŠTETOČINE I KOROVI KUKURUZA I NJIHOVO SUZBIJANJE
DISEASES, PESTS AND WEEDS OF MAIZE AND THEIR CONTROL
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The book is written in Serbo-Croatian. It consists of 5 chapters: agricultural engineering of maize, diseases of maize, maize pests, weeds in maize, motorization for protection. The middle three (most spacious) chapters have abstracts in English. At the end of each chapter we find colour pictures and plenty of references mostly from the Carpathian basin.

Maize is one of the most important cultivated plants in the world. This book is probably – at least in Europe – the most detailed work about plant protection of maize until now. It is written – 695 pages with 38 coloured picture-tables – by a group of 14 authors from different Universities and Institutes of several cities of Yugoslavia, that shows the importance of maize growing in Serbia.

The *first chapter* shortly informs us about importance of maize growing in general, hybrids and agricultural engineering of maize cultivation (no English abstract).

The *second chapter* is mainly written in accordance with numerous results on maize diseases obtained for the last 50 years in Serbia. This topic is divided into three parts:
(1) Parasitic Diseases
- caused by fungi – these are the most distributed and economically most important,
- caused by viruses – maize dwarf mosaic virus, beet mosaic virus and barley yellow dwarf virus are the most important in Serbia,
- spiroplasm, phytoplasm – which have not been detected yet in the country, and
- bacteria – it has insignificant economic importance in Serbia.

(2) Non-parasitic Diseases.
(3) Integrated Maize Protection.

A brief analysis of disease spread, deleteriousness and symptoms, biology and epidemiology of parasites, as well as control measures are presented. Beside parasites present in the country, some parasites that could endanger maize production in Serbia are also described. These diseases are classified into the following groups:
- Diseases of seeds and seedlings: a result of inadequately organised seed production, cropping practices and especially of too deep and early planting.
- Leaf spots: Beside some other insignificant types of leaf spots, Northern corn leaf blight was registered in Serbia. This type of leaf spot caused forced plant maturation – the greatest damages in the country – and a radical solution was the development of local resistant maize hybrids and their introduction into production.
- Diseases of above ground organs.

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- Root and stalk rots: one of the most spread and most deleterious maize disease in Serbia, which appeared quite frequently in the first generation of the local hybrids.
- Ear mouldiness: introduction of hybrid forms and application of mineral fertilisers significantly increased the damages resulting from ear mouldiness. In addition to direct damages (which recently has occurred in stored maize) significant losses arise from mycotoxins forming in mouldy ears (zearalenone and T2 toxine were the most frequently found). Such ears cause the development of mycotoxicoses in domestic animals (i.e. in hog breeding).

Maize yield significantly varied over years, regions and locations of the country as a result of adverse effects of abiotic factors. This chapter presents symptoms of injuries caused by chemicals, abnormal changes due to other causes, meteorogical and edaphic factors. These factors very often interact and often depend on applied cropping practices. The importance of crop rotation, soil tillage, fertilising, seeds, planting and irrigation within the integrated plant protection is also discussed. Problems regarding maize resistance to parasitic diseases and the role of biotechnology in parasite, pest and weed control are presented, as well. Maize parasitic diseases are described in details in this chapter. A great importance of the resistant hybrids within the integrated maize plant protection is underlined. This chapter presents the methods of artificial plant inoculations by various parasites, source of resistance and mode of inheritance, as well as several other topics related to this problem. Parasite, pest and weed biotechnical control is also described in this chapter. The following topics were especially emphasized: plant tissue culture, DNA recombinant technology, resistance of transformed plants to viruses, fungi and insects and importance of maize breeding and genetics for resistance to herbicides.

The content of the *third chapter* encompasses the following divisions: Introduction, Retrospective view on maize pests in Yugoslavia (Serbia and Montenegro), Field maize pests, Maize storage pests, Integrated maize pest control, References, Summary and List of pest Latin names. This chapter is based on 570 papers about maize pests of national and international authors. The field maize pests encompass about 70 more significant or important pest species. Noxiousness for certain pests and their control, biological and ecological aspects are presented. About 20 species of maize storage pests were observed. The studies of Yugoslavian authors claim, that approximately 130 species of various animal classes (25 are economically important) attack and damage maize during its growth. According to their number, and especially to their economic importance, insects are the most significant maize pests in Serbia. Insects are followed by mammals, nematodes, birds and mites. We can reed about pests damaging the underground parts of maize, parts close to soil surface, pests dangerous to sown seeds, about leaf and stalk pests and pests damaging generative organs of maize (tassels and ears). Great areas under maize are suitable for mass reproduction of pests, particularly, specific maize pests, which are closely related to this crop. This phenomenon very often occurs in smallholdings. Areas under small grain cereals, most often used as preceding crops (wheat is predominant) of maize, contribute to mass production of click beetles that are also dangerous maize pests. The greatest attention in the text on control of certain maize pests was paid to non-chemical methods (cropping practices, biological measures, growth of resistance hybrids). These actions and measures are important links within the integrated maize pest control. Larvae of western corn rootworm and click beetles are the

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most dangerous among the mentioned species. Crop rotation is the most important control measure for these two pests. Irrigation of commercial maize results higher yield. This procedure is a very important method to decrease reproduction and noxiousness of several pests, but it increases reproduction of some others. Several tables present effects of certain cropping practices on abundance of more important pests: crop rotation, sowing time, crop weediness, irrigation and soil management. Chemical maize pest control in Serbia is mostly applied against click beetles and maize leaf weevil. Fields under maize in the one-crop system shall be treated with insecticides in order to control western corn rootworm. One of the tables presents economic thresholds of noxiousness, pointing out the necessity of performing a particular chemical control. The data refer to all important pests in several countries. Due to systematic monitoring of pest distribution, abundance and development on account of forecasting the degree of their occurrence, it is possible to achieve more efficient and more economic protection of maize against pests, which will contribute to lesser application of pesticides. If all areas are surveyed for the number of larvae, great savings can be accomplished. Preventive actions (mechanical cleaning, improvement of storage premises, preventive chemical treatments), grain control at receipt, cleaning, cooling, drying, planned relocation of maize and temperature control, grain mass status during storing have priority within the integrated maize pest control. In case when pests attack maize they decide whether chemical or physical and mechanical measures should be taken.

The *fourth chapter* is written about weeds in maize field. Weeds are usual companions of cultivated plants. The most recent results on weed research in maize crops in Serbia reveal that there are 213 weed species, weed-ruderal and ruderal plants. Among these, the weed-ruderal species are the most distributed. The perennial species of geophytes and hemicryptophytes are less distributed. Their ability to reproduce vegetatively allows their intensive propagation and recalcitrance on cultivated soils. The seasonal dynamics are clearly expressed in the composition of the maize crop weed community. We can learn from the authors that our knowledge of the biology and ecology of weeds, as well as the structure of maize weed communities and their fluctuations which are dependent on environmental and agroecological conditions, are important when planning and undertaking weed control measures. This is particularly true with respect to the use of herbicides whose rational and efficient application should be based on the all-inclusive knowledge of floristic and phytocelonic relationships of weed vegetation. On the basis of this, as well as our knowledge of the biological characteristics of weeds, it is possible to choose the type, amount, timing and method of herbicide application in order to achieve maximum weed control efficiency with a minimum negative effect to the cultivated plant, environment and man. Weed control is a complex of various complimentary methods for their elimination. It should be conducted thoroughly in time and space on both cultivated plant and non-cultivated soils. The authors suggest to coordinate the measures with the biological and ecological characteristics of both maize and weeds in order to be more successful. Weed control is of preventive nature on non-cultivated and cultivated soils. Agriculture measures provide favourable conditions for cultivated plants and help weed control. They include primary and additional soil tillage, inter-row cultivation as well as other methods which increase maize yield and eliminate weeds. Chemical measures involve herbicide application, substances which directly eliminate weeds. Herbicide application has many advantages, but have certain negative effects on cultivated plants, man and his environment. For weed control in maize crops in Serbia 39 active substances with 134

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products of herbicides are used. Weed control in maize crops includes the use of selective herbicides of both contact and translocational activity. Their application involves soil treatment prior to, during and immediately after sowing and before crop and weed germination. It is underlined, that due to the heterogeneous agroecological conditions of certain maize growing regions in Serbia, as well as the floristic composition and structure of weed communities of maize crops, herbicide application must be specific and well planned at each location. For this reason, rational solutions for herbicide application should be found for each location. This includes minimum labor and expences with a maximum positive effect in weed control and the elimination of negative effects for the cultivated plant, man and his environment.

In the *fifth chapter* we can read about machines and their maintenance used in maize cultivation, especially in plant protection (mechanical, chemical and other special protection). This chapter does not have an English abstract.

The plant protection of maize is very important. The goal of the authors was to provide us with a quick update. They achieved it with the good structure of chapters and subdivisions.

This book is very practical and can be useful for experts working in different fields: agronomy, plant protection, production of insecticides etc., and also for lecturers, students and Ph.D. students of agriculture universities. Using these results in plant protection of maize we can reduce damage, heavy losses in production in an economically and ecologically accepted way and with the smallest possible risk. The project was supported and sponsored by many agricultural organizations and companies. Their list and advertisements can be seen as a final chapter of 40 pages at the end of the book.

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