WEED SEED BANK UNDER SOME FIELD CULTURES

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Abstract: *Mapping and monitoring of weed seeds on agricultural and non-agricultural areas is long lasting praxis in many countries. A study of weed seed bank under various cultures provides opportunities of prediction, which weed species, in what volume and in what time will occur on the field. In such a manner, it is possible to make more efficient end economical plan of measures for their control. During vegetation period 2008-2009, in the locality Ratkovo (Vojvodina), studies of the weed seed bank were performed under wheat, sugar beet and clover crops. Plots were nearby, and therefore, the influence of climatic and edaphyic factors was identical. In average, samples were heavy 1.5 kg, they were taken from each plot in four repetitions, diagonally, and separately from depths of 0-10 cm, 10-20 cm and 20-30 cm. After sieving of the samples through copper sieves that differed in diameter followed their drying and determination. The obtained data were statistically processed in the program Statistica 9. Under wheat crop seeds of 15 weed species were separated, of which in the greatest measure dominated seeds of weed species Amaranthus retroflexus, Datura stramonium and Solanum nigrum, in all of the studied layers. Seeds of A. retroflexus were the most numerous in the top soil layer (314 seeds/m²), as well as seeds of D. stramonium (134 seeds/m²), while seeds of Solanum nigrum proved to be dominant in the deepest studied layer (234 seeds/m²). The greatest total seed quantity of all weed species was extracted from the top layer of 0-10 cm (854 seeds/m²), and the lowest from the deepest layer of 20-30 cm (715 seeds/m²). In sugar beet were found seeds of 12 different weed species, and dominant were seeds of Amaranthus retroflexus in all studied depths of the soil layer. The highest seed quantity of A. retroflexus was established in soil layer of 10-20 cm (221 seeds/m2), and somewhat lower in the layer of 20-30 cm (209 seeds/m2), and the lowest in the top arable soil layer (187 seeds/m2). Seeds of Chenopodium album were also dominant in the top soil layer (89 seeds/m2), while seeds of other weed species occurred in significantly lower number. Total number of all separated seeds was the highest in the studied top soil layer (502 seeds/m²). Under clover crop seeds of 12 weed species were also separated, and dominant were seeds of Amaranthus retroflexus in the top layer (144 seeds/m²) and Chenopodium album in the deepest soil layer (95 seeds/m²). The highest number of all seeds was found in the soil layer of 0-10 cm (288 seeds/m²). In all three studied plots, the highest quantity of weed was established in the top layer of 0-10 cm, which is the consequence of inadequate application of cultural practices, above all, lack of deep soil cultivation. Based upon the obtained results it is possible to predict occurrence and volume of weed species in the studied plots in the following vegetation season. This enables creation of the most efficient plan of cultivation and chemical weed control.*

Key words: *clover, sugar beet, weed seed bank, wheat*

INTRODUCTION

Agro-ecological system, as dynamic ones that are prone to constant changes under the influence of anthropogenic factor stipulate the occurrence of those weed species that can adapt to these changes (YOUNG and EVANS 1976; REINERS 1983; VOGL 1980, SOUSA, 1984). Seed delay and dormancy in the soil of the arable land is the longest and the most important phase in weed life cycle (SESTER et al. 2006). Weed soil seed bank is very changeable in space and time which depends upon numerous factors, of which the most important are choice of the crop, choice of cultural practices and time of their application, crop rotation, as well as choice of herbicides and their efficiency (OVAISI, et al. 2006; BALL 1992; BLACKSHAW et al. 2001;

BUHLER 1997; FORCELLA et al. 1997). Exactly due to its variability, monitoring is not the process performed once, but it is continuing. Mapping and monitoring of quantitative and qualitative weed seeds properties is of tremendous importance for it enables long-lasting forecasts on weed occurrence in the field (OVAISI et al. 2006). Beside this, monitoring and understanding of weed seed bank dynamic is of the crucial significance for improvement of the system of weed control, especially in the frame of integral production (BUHLER et al. 1997). Although it is well known that soil weed seed bank is the main source of the newly germinated weeds and primary reason of the occurrence of invasion of certain weed species, seed bank studies have not yet been paid enough attention (COUSENS and MORTIMER 1995; DAVIS 2006).

MATERIAL AND METHODS

During vegetation season 2008-2009, studies of weed soil seed bank were performed in the locality Ratkovo in Vojvodina, under wheat, sugar beet and clover crops. All studied parcels were nearby. Weed seeds are not evenly distributed in the field; therefore, soil sampling was performed by including whole width and depth of the soil layer. In the experiment soil sampling from the plots was made diagonally, with 4 replications in each plot. Samples that in average weighted 1.5 kg were taken separately from depths of 0-10 cm, 10-20 cm and 20-30 cm (SMUTNÝ and KŘEN, 2002). After sieving of the samples through copper sieves that differed in diameter, followed their drying on room temperature and manual seed separation, as well as their determination by microscope and determinators (KRONAVETER and BOŽA, 1994, SKENDER et al., 1998).The obtained data were statistically processed in the program Statistica 9. The main objective of the study was determination of quantitative and qualitative properties of weed seeds in arable soil layer of 0-30 cm under various crops in identical climatic conditions.

RESULTS AND DICUSSIONS

From taken soil samples under wheat crop, seeds of the following 15 species were separated and determined (Figure 1): *Abutilon theophrasti* Medic.*, Amaranthus retroflexus* L.*, Bylderdikia convolvulus* (L.) Dum.*, Capsicum annum* L.*, Chenopodium album* L.*, Datura stramonium* L.*, Euphorbia cyparissias* L.*, Hibiscus trionum* L.*, Polygonum aviculare* L.*, Polygonum lapathifolium* L.*, Sinapis arvensis* L.*, Setaria glauca* (L.) P.B.*, Solanum nigrum* L.*, Sorghum halepense* (L.) Pers.*,* and *Veronica hederifolia* L. Of all determined species in all studied soil layers dominated seeds of weed species *Amaranthus retroflexus, Datura stramonium* and *Solanum nigrum.* Seeds of *A. retroflexus* was the most numerous in the top, shallowest soil layer with 314 seeds/ m^2, as well as sees of *D. stramonium* with 134 seeds/ m^2, while seed of *Solanum nigrum* proved to be dominant in deepest soil layer with 234 seeds/ m^2. The highest total quantity of seeds of all weed species was separated from the top layer of 0-10 cm (854 seeds/ m^2), and the lowest from the deepest layer of 20-30 cm (715 seeds/ m^2). LSD test showed that in various depths of soil layer there were not statistically significant differences in number of seeds of weed species.

In sugar beet were found seeds of 12 different weed species (Figure 2): *Abutilon theophrasti* Medic.*, Amaranthus retroflexus* L.*, Bylderdikia convolvulus* (L.) Dum.*, Capsicum annum* L.*, Chenopodium album* L.*, Datura stramonium* L.*, Polygonum aviculare* L.*, Polygonum lapathifolium* L.*, Sinapis arvensis* L.*, Solanum nigrum* L.*, Sorghum halepense* (L.) Pers.*,* and *Veronica hederifolia* L. In whole depth of the arable layer dominant was seed of *Amaranthus retroflexus*, but the highest quantity of its seed was determined in the soil layer of 10-20 cm with 221 seeds/m^2, somewhat lower in the layer of 20-30 cm with 209 seeds/m^2, and the lowest in the layer of 0-10 cm with 187 seeds/m^2.
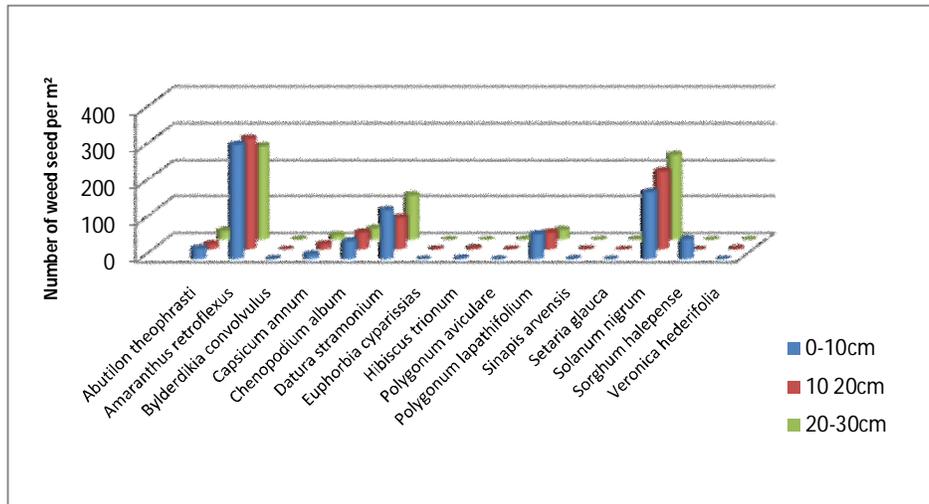
Figure 1: Number of seeds of weed species under wheat crop in locality Ratkovo

Seeds of *Chenopodium album* also proved dominant in the shallowest soil layer with 89 seeds/m^2. In the period 2002-2004 in Turkey Rýza and Şevki also established dominance of *A. retroflexus* and *C. album* seeds under sugar beet crops, and in 2008 in our country the same was found by KONSTANTINOVIC et al. (cit. KONSTANTINOVIĆ et al. 2009). Seeds of other weed species occurred in significantly lower number. Total number of all separated seeds was the highest in the shallowest layer with 502 seeds/m^2). LSD test proved that in the obtained results there were no statistically significant differences.
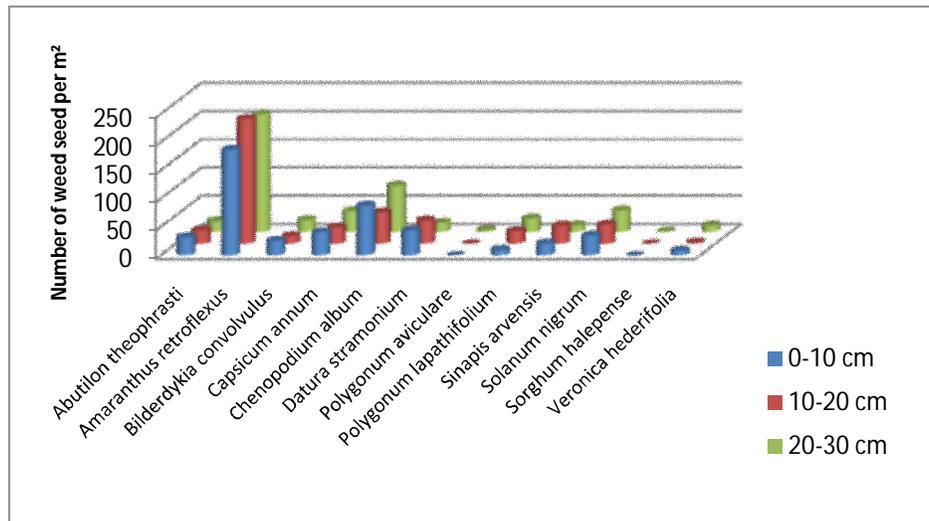

Figure 2: Number of weed species seeds under sugar beet crop in the locality Ratkovo

Under clover were separated seeds of 12 weed species (Figure 3), of which seeds of *Amaranthus retroflexus* proved to be dominant in the shallowest soil layer with 144 seeds/ 144 /m² and *Chenopodium album* in the deepest studied layer with 95 seeds/m². The highest total number of all separated weed seeds was in the soil layer of 0-10 cm (288 seeds/m²). Increased number of *C. album* seeds in clover crops was also established by the other authors (BELLINDER et al., 2004). LSD test showed that there are no statistically significant differences in number of weed seeds in the studied soil layer. ALBRECHT (2005) established that clover in crop rotation significantly reduces weed seeds in the soil, even up to 39%, as well as the total quantity weeds in the field. Therefore, further experiments in the locality Ratkovo would be desirable.
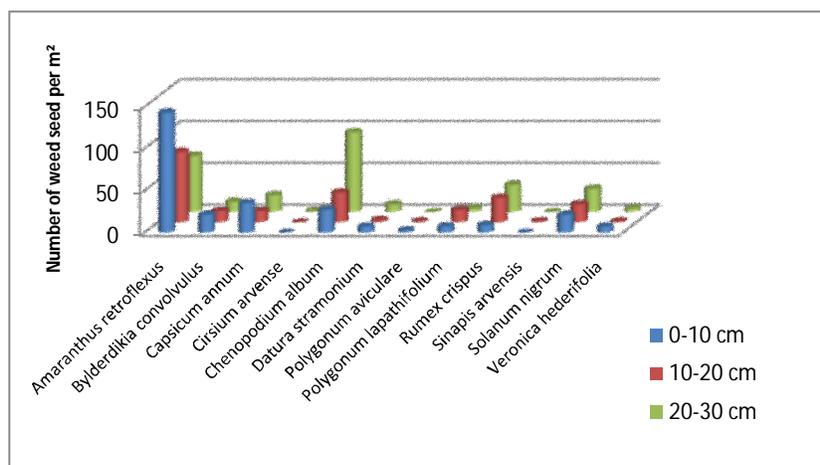

Figure 3: Number of weed species seeds under clover in the locality Ratkovo.

CONCLUSIONS

Soil seed bank is very changeable in space and time which depends upon numerous factors and its monitoring is not performed once, but it represents continuing process. Mapping and monitoring of weed seed bank is of great importance for forecast of weed occurrence in the field, as well as for improvement of the system of weed control. Results of weed seed bank under 3 different crops showed that in all studied plots dominated seeds of dicotyledonous weed species and of cotyledonous were separated only seeds of *Setaria glauca* and *Sorghum halepense* in wheat and sugar beet crops. In all three studied plots, the highest quantity of all present weed species was established in the top layer of 0-10 cm, which is the consequence of inadequate application of cultural practices, especially lack of deep cultivation. Seeds of widely distributed weed species *A. retroflexus* and *C. album*, that grow in different environmental conditions due to their low life needs, showed dominance in all plots (Šinžar and Janjić, 1995). In the studied plots occurrence of weed species *A. retroflexus* and *C. album*, whose seeds showed dominance in all obtained results can be predicted with certainty. This enables preparation of more efficient crop protection from weeds by combined control measures.

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