

## **CROP ROTATION INFLUENCE ON THE WEED INCIDENCE IN CEREALS**

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### **Abstract**

Analysis of the crop rotation influence on the weed incidence in cereals is based on monitoring of crops during 1997–2007 in Kurzeme and Zemgale regions of Latvia. The Department of Soil Management (currently the Institute of Soil and Plant Sciences) of Latvia University of Agriculture has been studying the dynamics of weed level in fixed annually observed areas. The type of crop rotation was selected by a land holder. The weed infestation was determined using the quantitative occurrence method developed by A. Rasinsh and M. Taurina /Rasiņš, Tauriņa, 1989/. The support of this method is a correlation between the incidence of weed species in the field and the number of weed species per m<sup>2</sup> of field area. The incidence of weeds was studied in four types of crop rotation in 2007: cereals grown in a crop rotation; repeated cereal sowings; cereals during five years without exchange and winter wheat during 4–5 years. Significance of crop rotation for weed control systems was certified by comparison of weed species incidence in fields.

Key words: weed incidence, crop rotation influence, cereals.

### **Introduction**

Weeds are often one of the biggest problems in agricultural practices. With careful management these problems can be overcome. Populations of certain weed species are suppressed by competition from the crop or by the selective use of herbicides. The success of rotation systems for weed suppression appears to be based on the use of crop sequences that create varying patterns of resource competition, allelopathic interference, soil disturbance, and mechanical damage to provide an unstable and frequently inhospitable environment that prevents the proliferation of a particular weed species. Crop rotation is indeed one of the most important factors that farmers can alter to better manage their weed infestation /Lejiņš, Lejiņa, 2000/.

Changes in weed populations are the result of selection pressures imposed by agronomic practices in conjunction with the modifying effects of the prevailing environmental conditions.

The importance of weed monitoring was established in early publications about the results of investigations /Lapins et al., 1999; 2000; 2004; Korolova et al., 2006; Vanaga, 2004/. The researches in Lithuania /Kavoliūnaitė et al., 2000/, Estonia /Тойво, 1997/, Belarus /Сорока, Романок, 1997/ and Russia /Ульянова, 1997/ verify that too.

The analysis of long-term and annual observations of weed incidence enabled us to determine the effects of crop rotation and chemical weed control.

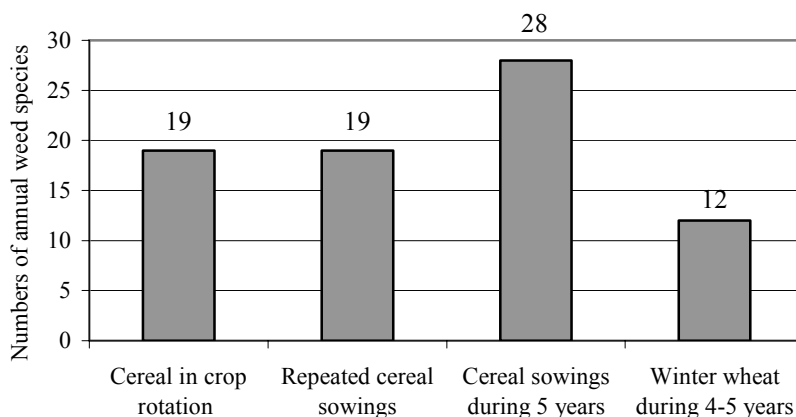
### Materials and Methods

The assessment of weed incidence was carried out at the end of July from 1994 in Jelgava, Dobele, Saldus, Talsi, Tukums and Kuldīga districts of central and western Latvia. The Department of Soil Management (currently the Institute of Soil and Plant Sciences) of Latvia University of Agriculture has been studying the dynamics of weed level in fixed annually observed areas. The observation was done on conventional and biological farms. The type of crop rotation was selected by a land holder. The weed infestation was determined using the quantitative occurrence method developed by A. Rasiņš and M. Taurina /Rasiņš, Taurina, 1982/. The support of this method is a correlation between the incidence of weed species in the field and the number of this weed species per m<sup>2</sup> of field area.

Forty five cereal fields were observed in the year 2007. The data on the choice of preceding crop for cereals suggest that there were 17.8% repeated cereal sowings and 28.9% cereals during five years without exchange. 22.2% of cereals were grown in a crop rotation in 2007. Winter wheat sowings repeated during 4–5 years were completed 6.7% of all repeated and without exchange cereals.

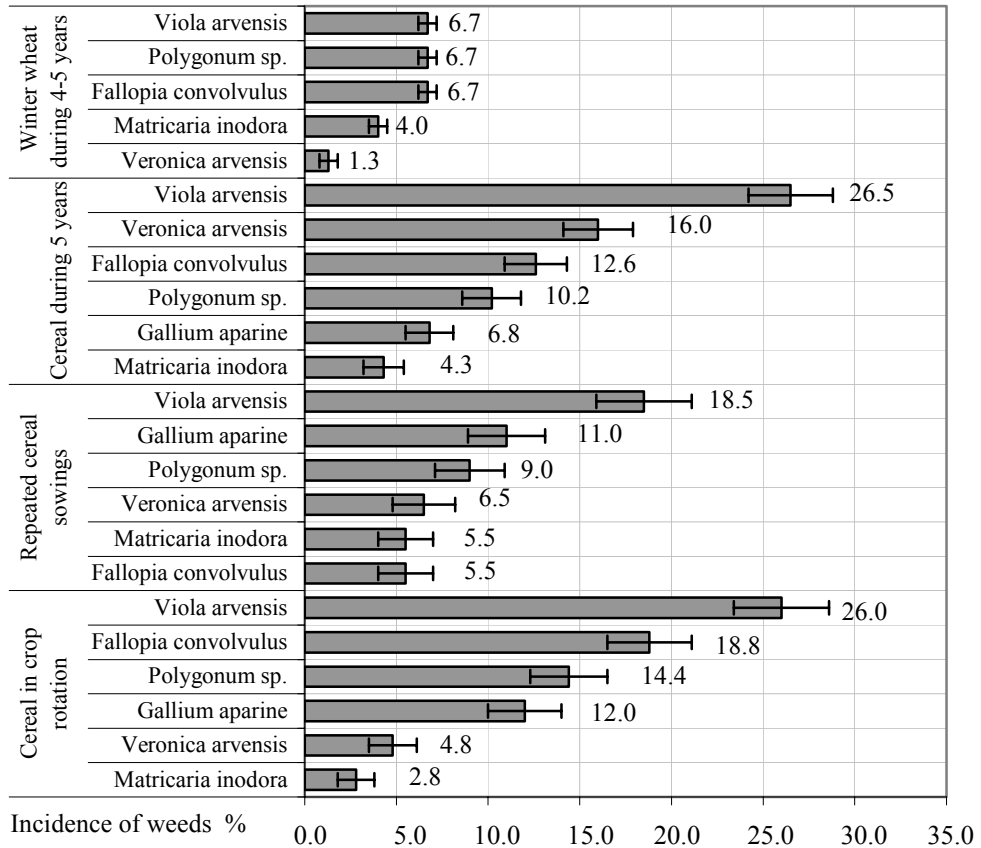
### Results and Discussion

The greatest number 28 of annual weed species and genera was established in five-year cereal sowings without exchange (Figure 1). The greatest diversity of annual weeds in cereals without crop rotation is explainable with weed accommodation to oneself to sowing system without exchange during 5 years.



**Figure 1.** Numbers of annual weed species in cereal in 2007 as affected by the crop rotation

The smallest number of weed species 12 was in winter wheat 4–5 repeated sowings. The lowest number for repeated sowings based on successful management and chemical control in these fields. Some weed species accommodated for this system, but number of weed per 1 m<sup>2</sup> is smallest than in other types of crop rotation (Figure 2).

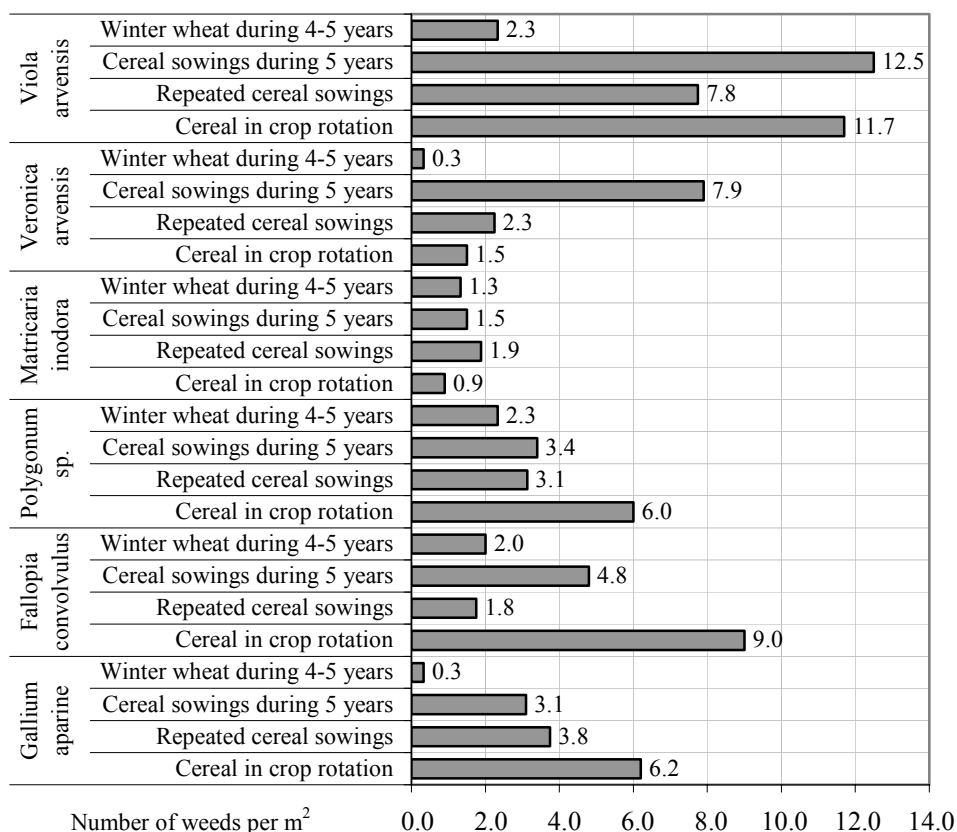


**Figure 2.** The incidence of annual weed species as influenced by the crop rotation %

The analysis of the incidence of annual weed species depending on the crop rotation shows significant higher level of *Viola arvensis*, *Veronica arvensis* and *Fallopia convolvulus* in cereals repeated during 5 years than in winter sowing without exchange (Figure 2).

The choice of preceding crops for cereals in the crop rotation systems provided significant decrease only in *Veronica arvensis* incidence in comparison with cereals repeated during 5 years.

The number of annual weeds *Matricaria inodora* and *Veronica arvensis* was the smallest in the cereals with crop rotation (Figure 3). The number of *Gallium aparine*, *Fallopia convolvulus*, and *Polygonum sp.* was the smallest in winter wheat and five-year cereal sowings without exchange.



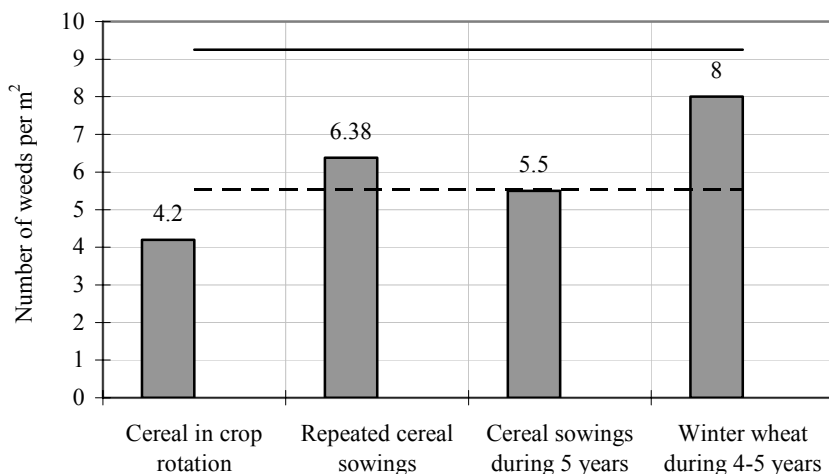
**Figure 3.** Number of annual weeds per m<sup>2</sup>, in cereal as influenced by the crop rotation

In cereals during 5 years were established augmented quantity of *Veronica arvensis* and *Viola arvensis*. The lowest numbers of *Viola arvensis*, *Veronica arvensis* and *Gallium aparine* were in 4–5 repeated winter wheat sowings in comparison with other repeated sowings (Figure 3).

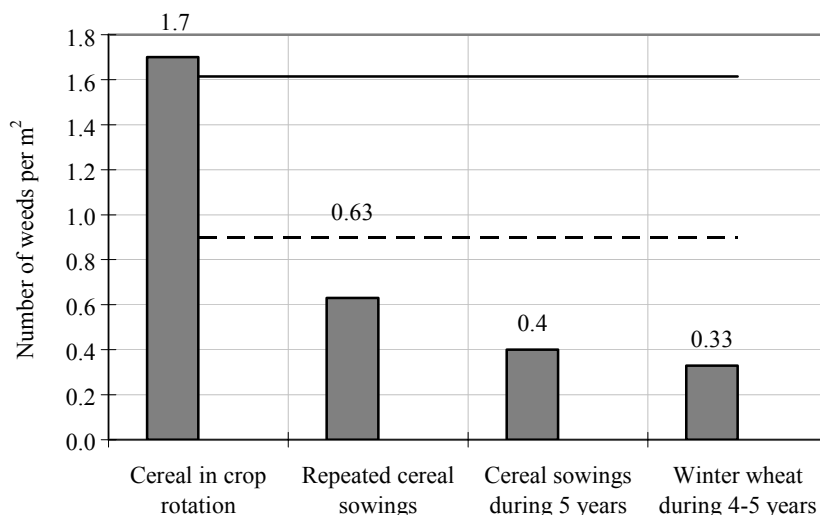
Cereals in the crop rotation provided a significant decrease in the number of *Agropyron repens* and winter wheat repeated sowings provoke infestation of monocotyledonous weeds (Figure 4). In effect, the higher degree of change with monoculture than with the rotation simply reflects the fact that monoculture provided the maximum opportunity for the best-suited species increase.

Conversely, the number of *Cirsium arvense* was significantly higher in cereals with crop rotation than in sowings without exchange (Figure 5). That is results of possibility of successful chemical control of this dicotyledonous weed.

Repeated cereal sowings not only promote infestation with *Agropyron repens*, but increase the incidence and quantity of *Avena fatua* (Figure 6). *Agropyron repens* was established in 4.4% of cereal fields with crop rotation, but the incidence up 5.5 to 8.0% for repeated cereals.

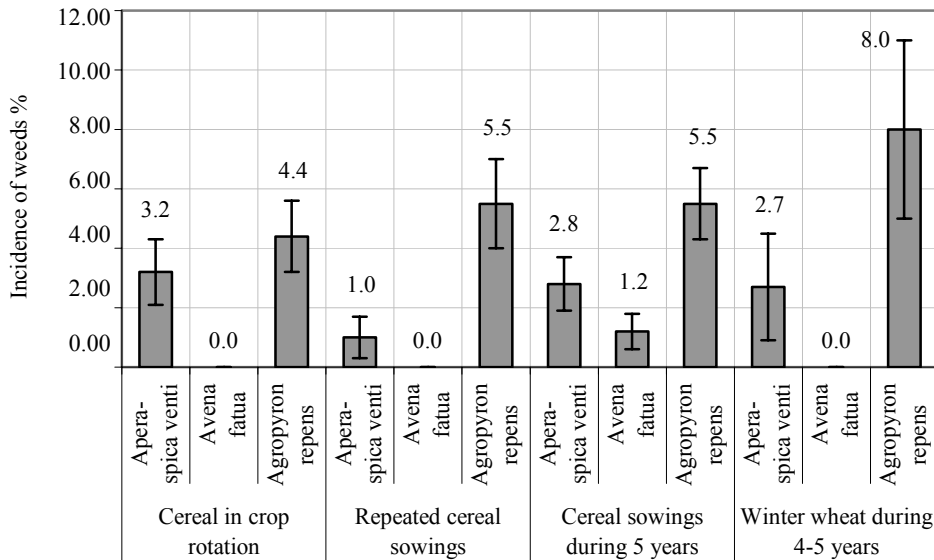


**Figure 4.** The number of *Agropyron repens* as influenced by the preceding crop and in comparison with average confidence level of weeds number in cereal sowings



**Figure 5.** Number of *Cirsium arvense* as influenced by the preceding crop and in comparison with average confidence level of weeds number in cereal sowings

The incidence of *Apera-spica venti* was 3.2% in crop rotation variant and 2.8% in 5 years repeated cereals. The same tendency was noted in winter wheat during 4–5 years. Repeated cereals sowings did not increase the incidence and quantity of *Apera-spica venti*.



**Figure 6.** The incidence of monocotyledonous weeds as influenced by preceding crop %

### Conclusions

1. Weed monitoring 2007 revealed differences of weed incidence in four types of crop rotation in Kurzeme and Zemgale region of Latvia: cereals grown in crop rotation; repeated cereal sowings; cereals during five years without exchange and winter wheat during 4–5 years.

2. The greatest number of annual weed species and genera (28) was established in cereal sowings without exchange during five years. The smallest number of weed species (12) was in winter wheat 4–5 repeated sowings.

3. The incidence of annual weed species *Viola arvensis*, *Veronica arvensis* and *Fallopia convolvulus* was significantly higher in cereals repeated during 5 years than in winter wheat sowing without exchange.

4. Crop rotation systems provided significant decrease only to *Veronica arvensis* incidence in comparison with cereals repeated during 5 years.

5. The quantity of annual weeds *Matricaria inodora* and *Veronica arvensis* was the smallest in cereals with crop rotation.

6. The number of *Gallium aparine*, *Fallopia convolvulus*, and *Polygonum* sp. was the smallest in winter wheat and five-year cereal sowings without exchange, as well as augmented quantity of *Veronica arvensis* and *Viola arvensis*.

7. Crop rotation provided a significant decrease in the number of *Agropyron repens*, conversely, the number of *Cirsium arvense* was significantly highest. Repeated cereals sowings did not increase the incidence and quantity of *Apera-spica venti*.

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