8. Lazauskas, J. (1999) Development of crop production on sandy and sandy-loam soils. /In: *Agriculture in the south-east of Lithuania: scientific, economic and social aspects*, Vilnius, 132-140 (In Lithuanian).
9. Miedaner, T., Schneider, B., Geiger, H.H. (2003) Deoxynivalenol (DON) Content and Fusarium Head Blight Resistance in Segregating Populations of Winter Rye and Winter Wheat, *Crop Science*, 43, 519-526.
10. Nedzinskas, A. (2001) Productivity of cereal and leguminous plant crops on sandy loam soil, *Agricultural Sciences*, 3, 11-16 (In Lithuanian).
11. Nedzinskas, A. (2001) Productivity of cereal and leguminous plant crops on sandy loam soil, *Agricultural Sciences*, 3, 11-16 (In Lithuanian).

ZIEMAS RUDZU (*SECALE CEREALE* L.) AUDZĒŠANAS TEHNOLOĢIJAS VIENKĀRŠOŠANA

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Rakstā ietverti dati par ziemas rudzu audzēšanas tehnoloģijas pētījumiem, veiktiem laika periodā no 1994.-2006. gadam. Lauka izmēģinājumi veikti smilšmāla augsnē (*Haplic Luvisol*) ar mērķi novērtēt augsnes sagatavošanas, izsējas normas un slāpekļa mēslojuma ietekmes uz ziemas rudzu graudu ražu un uz nezāļu daudzumu un svaru. Tika konstatēts, ka ziemas rudzos lielāks nezāļu skaits un masa ir pie minimālās augsnes apstrādes (bez aršanas) un pie lielākas slāpekļa normas.
Palielinot ziemas rudzu izsējas normu no 2.7 miljoni sēklu ha^{-1} uz 5.7 miljoni sēklu ha^{-1}, nezāļu sausā masa samazinājās no 27.7 g m^{-2} līdz 19.8 g m^{-2} augsnē bez aršanas un no 36.5 g m^{-2} līdz 23.6 g m^{-2} uzartā augsnē. Slāpekļa mēslojumam bija lielāka ietekme uz ražu nekā izsējas normai. Lietojot slāpekli, ziemas rudzu raža bija par 70.4 % augstāka artajā augsnē un par 66.6 % augstāka diskotā augsnē (bez aršanas), salīdzinot ar nemēslotu rudzu graudu ražu.

RESULTS OF WEED MONITORING IN THE LONG-TERM EXPERIMENTAL FIELD IN PRIEKULI

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Abstract

The negative role of weeds in agriculture will be emphasized. They can considerably reduce an amount and the quality of the yield. To make out the influence of different agroecological factors on the weed infestation of arable land, a long-term field experiment was commenced in the Priekuli Plant Breeding Institute (57°19'N, 25°20'E). The investigation was established on a soddy podzolic light loam soil. Data on species and the amount of weeds was collected from the fields of five different fertilization systems. The aim of the research is to show the weed dynamic data, obtained from a 17-year period, in regards to the fertilization system and the management practice in the classical crop rotation: barley – clover/grass – rye – potato.
Results show that the least amounts of the weeds were in unfertilized fields. More weeds were in plots, where stable manure was used as fertilization.

Key words: weeds, long-term experiments, fertilization, crop rotation

Introduction

The negative role of weeds in agriculture is well known. Weeds compete with crops for nutrients. An increase in weed invasion, results in a more intensive consumption for soil nutrients by the agricultural community. Intensive nutrient consumption by weeds leads to an increasing drop in crop yield (Lauringson *et al*., 2000).
The main purpose of crop rotation is to maintain the fertility of the soil, to increase the amount and the quality of the yield. The crop is influenced by soil properties, weeds, the spread of diseases and pests. For this reasons it is not good to grow a crop that was harmed by the same diseases and pests

as previously grown crop. After crops with high weed infestation there should be grown crops that better compete with weeds.

The crop rotation of Norfolk is recognized as a classical and the most successful rotation for the maintenance of soil fertility and reducing weed infestation. This famous light land arable four-course rotation consisting of roots followed by spring barley followed by red clover followed by winter cereals was introduced by Townshend around 1730 (Wibberley, 1996). The rotation consists of 50% cereals, roots 25 % and clover/grasses 25 % and the above mentioned succession allows for the adequate restoration of fertility between corn crops (Rubenis, 1979).

A similar crop rotation was established at the State Priekuli Plant Breeding Institute in 1958. Some results of weed infestation from this experimental field have been published before (Zarina, 1997; 2004; 2006). This investigation covers the period from 1990-2006. The aim of the research was to show the weed dynamic data, obtained from a 17-year period in barley after full crop rotations, in dependence of the fertilization system and the management practice. Our hypothesis is that clover/grasses ley helps to reduce the weed infestation in crop rotation.

Materials and Methods

The long-term crop-rotation experimental field was established at the State Priekuli Plant Breeding Institute in 1958. It includes crop rotation barley – clover/grass – rye – potato in five different fertilization systems: unfertilized, stable manure 20 t ha^{-1} (N-68, P-38, K-58), NPK (N-66, P-90, K-135), stable manure 20 t ha^{-1} + NPK (N-134, P-128, K-193), doubled NPK (N-132, P-180, K-270).

Sowing time is the 1^{st} decade of April for spring crops. The clover in rotation is red clover, which is established as an under-sown crop in barley.

The size of each plot is 100 x 5.9 m. Herbicides and fungicides were not applied during the experiments, but the seeds were treated with fungicides. Weeds have been controlled by ridging in the potatoes and sharing of stubble surface after the harvesting of cereals.

The number of weeds was determined in the first decade of June in ten replicates from the area 0.1 m^2 by the counting method (Rasins, Taurina, 1982). Results were expressed for 1 m^2. All weed stages were counted (including cotyledons).

Results and Discussion

The results of weed monitoring show that the highest amount of weeds in the plots was found, where stable manure was used as fertilization (Figure 1). The amount of weeds did not exceed 162 plants per m^{-2} in the unfertilized plot – there weeds were small and not vital. In plots, fertilized with NPK and doubled NPK number of weeds was 45-226 plants per m^{-2}.

There were identified 29 different weed taxons in total – 21 annual and 8 perennial weed species. The most widely distributed annual weeds were *Vicia spp*., *Chenopodium spp.*, *Spergula arvensis*, *Viola arvensis* and *Stellaria media*, perennial – *Cirsium spp.*, *Sonchus spp.* and *Equisetum arvense*. The barley crop rotation nine weed taxons were rare – five annual weed species (*Erodium cicutarium*, *Anthemis arvensis*, *Poa annua*, *Galium aparine* and *Veronica spp.*) and four perennial weeds (*Rumex crispus*, *Taraxacum spp.*, *Ranunculus spp.* and *Plantago spp.*).

The dominant species of weeds differ when compared to the years 1990 and 2006 or after four full crop rotations (Figure 2). In the unfertilized plot some species, dominating in 1990 (*Equisetum arvense*), were not registered in 2006 and vice versa (*Viola arvensis* and *Raphanus raphanistrum*). There were even more weeds after four full crop rotations (Figure 1). The same weed species – *Viola arvensis* and *Spergula arvensis* – dominated also in 2006 in the field, where stable manure was used as fertilization. The composition and amount of dominant weeds differ in these years also in plots with other fertilization systems.

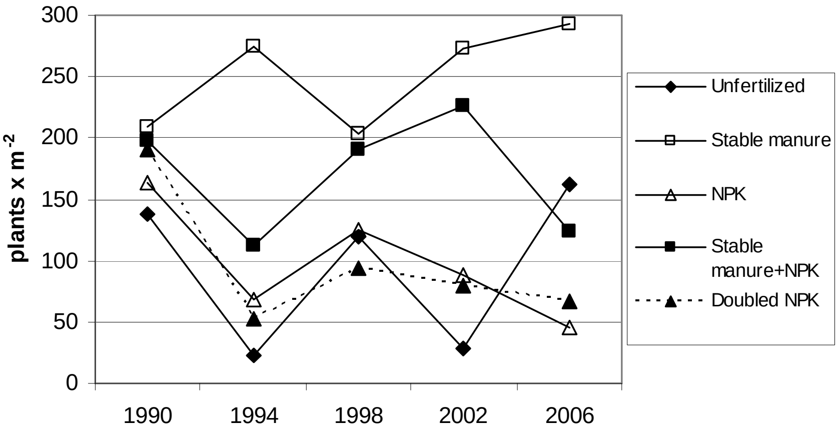

Figure 1. Total amount of weeds in barley under different fertilization systems after full crop-rotations in the 17-year period

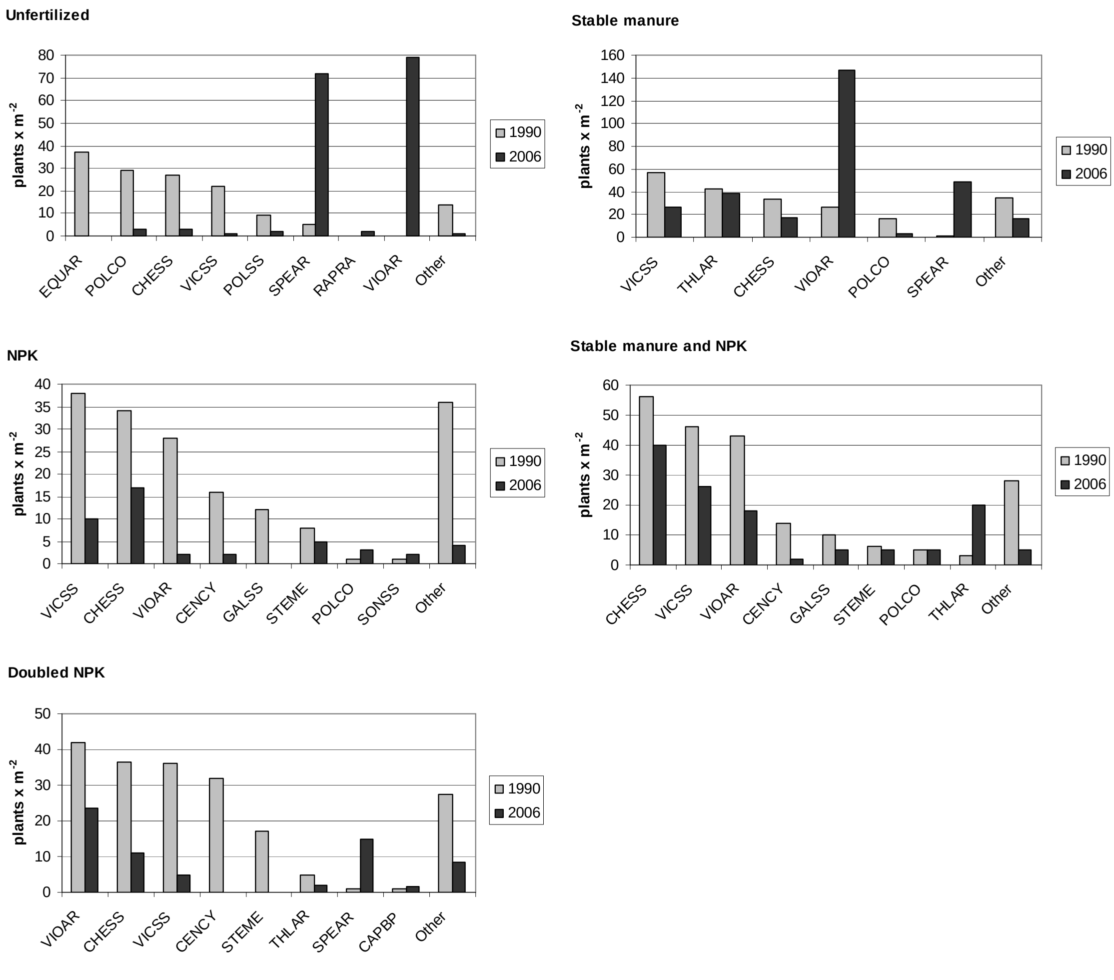

Figure 2. Dominant species of weeds in plots with different fertilization systems

CAPBP – *Capsella bursa-pastoris*, CENCY – *Centaurea cyanus*, CHESS – *Chenopodium species*, EQUAR – *Equisetum arvense*, GALSS – *Galeopsis species*, POLCO – *Polygonum convolvulus*, POLSS – *Polygonum species*, RAPRA – *Raphanus raphanistrum*, SONSS – *Sonchus species*, SPEAR – *Spergula arvensis*, STEME – *Stellaria media*, THLAR – *Thlaspi arvense*, VICSS – *Vicia species*, VIOAR – *Viola arvensis*

These differences between the years 1990 and 2006 in the composition of weed species do not mean that there are not these weeds in the seed bank. It is probable that the seeds were not

germinated and were waiting for better weather conditions, more favourable temperatures and precipitation. The amount of germinated weeds depend on weather conditions before registration of weeds (on April, when the vegetation period starts, on May and on the beginning of June).
An similar to ones investigation was carried out in Poland (Jaskulska, 2004). In the spring barley *Spergula arvensis* and *Chenopodium album* dominated. Also in our investigation these weed species were among the dominating weeds in spring barley. The lowest dry mass of weeds in spring barley was in the unfertilized fields and in the field where fertilization was used as stable manure. In our investigation weeds were not weighed, but the weeds in the unfertilized fields and in fields fertilized with stable manure were not as vital as weeds in plots fertilized with NPK and doubled NPK.
To understand weed impact on the amount and quality of the yield, it was necessary to compare weed data with the indices of the yield. This was not done in this investigation. The investigation in Canada (Stevenson, Légère, 1998) did not confirm that weed infestation overcomes the quality taken to protect spring barley. The negative influences were by other factors, not weed impact.
As no herbicides were used in our investigation, the number of weeds in the fields of crop rotation was dependent on cultivated crops, the succession of crops in the crop rotation links and crop cultivation technologies as in organic farming systems (Ausmane *et al*., 2008). Four-field crop rotation: barley – clover/grass – rye – potato, is recognised as the classical and successful crop rotation in regard to soil properties, crop yield and weed infestation. This was affirmed also this by investigation – the amount of weed seedlings did not exceed 293 plants per m^{-2} in none of the fertilization backgrounds. This was published also before (Zarina, 2004), that classical crop rotation was the most effectual for the restriction of weed seedlings in a field and the major amount of weeds were found in fertilizing systems with stable manure.

Conclusions

The results show that the least amounts of the weeds were in unfertilized fields. More weeds were in plots, where fertilization used as stable manure. The use of stable manure probably increased the amount of weeds.
In regards to our hypothesis, the average amount of weeds did not exceed 300 plants per m^{-2} in any of the fertilization systems, although the amount of weeds changed over time. The positive impact of clover/grasses ley is visible also in barley after two years, when rye and potato were grown in the field.

References

1. Ausmane, M., Gaile, Z., Melngalvis, I. (2008) The investigation of crop weediness in the crop rotation of organic farming system. Latvian Journal of Agronomy, 10, 25-31.
2. Jaskulska, I. (2004) Effect of multi-year differentiated fertilization on the weed infestation of spring barley and winter wheat in crop rotation. Acta Scientiarum Polonorum – Agricultura, 2004, 3, 1, 91-97.
3. Lauringson, E., Kuill, T., Vipper H., Talgre L. (2000). The effect of crop rotation, autumnal soil cultivation and chemical herbicides on the productivity and weediness of crops. The results of long-term field experiments in Baltic States, Proceedings of the International Conference, Jelgava, 71-80.
4. Rasins, A., Taurina, M. (1982) Methodic of counting of weeds in Latvia conditions (In Latvian), Riga, LMZTIP. 24.
5. Rubenis, J. (1979) Agrotechnical basics of crop rotations (In Latvian). Liesma, Riga. 114.
6. Stevenson, F.C., Légère, A. (1998). Manure, Tillage, and Crop Rotation: Effects on Residual Weed Interference in Spring Barley Cropping Systems. Agronomy Journal 90: 496-504.
7. Wibberley, J. (1996) A brief history of rotations, economic considerations and future directions. In.: Rotations and Cropping Systems. Aspects of Applied Biology 47, The Association of Applied Biologists, 1-10.
8. Zarina, L. (2006) Soil tillage as weed management factor. NJF Seminar 378. Tillage systems for the benefit of agriculture and the environment 'Extended abstracts' Arranged by NJF section I: Soil, water and environment. Nordic Agricultural Academy, Odense, Denmark, 215-218.
9. Zarina, L. (2004) Weed population dynamic by influence of crop rotation in 40-years period. 6th EWRS Workshop on Physical and Cultural Weed Control, Lillehammer, Norway, 85-92.
10. Zarina, L. (1997) Weediness in lasting period without herbicides application. Weed control in Baltic region. Latvia University of Agriculture, Jelgava, 8-10.

NEZĀĻU MONITORINGS ILGGADĪGAJĀ IZMĒĢINĀJUMU LAUKĀ PRIEKUĻOS

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Lauksaimniecībā tiek uzsvērta nezāļu negatīvā loma. Tās var būtiski samazināt ražas daudzumu un kvalitāti. Lai noskaidrotu dažādu agroekoloģisko faktoru ietekmi uz nezāļainību tīrumos, Priekuļos (57°19'Z, 25°20'A) tika uzsākts ilglaicīgs pētījums. Izmēģinājums tika ierīkots velēnu podzolētā viegla smilšmāla augsnē. Nezāļu sugu un daudzuma dati tika iegūti no laukiem piecos atšķirīgos mēslojuma fonos. Pētījuma mērķis ir parādīt ilgtermiņa (17 gadu) nezāļu dinamiku atkarībā no mēslojuma sistēmas un arī laukauga specifikai atbilstošās augsnes apstrādes paņēmieniem klasiskajā augu sekā: mieži – āboliņš/zālaugi – rudzi – kartupeļi.
Vismazāk nezāļu uzskaitītas nemēslotajos lauciņos. Visvairāk nezāļu bija lauciņos, kuros kā mēslojums lietoti kūtsmēsli.

SOWING TIME INFLUENCE ON THE YIELD OF WINTER WHEAT UNDER THE CLIMATE CONDITIONS OF ZEMGALE

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Abstract
A 3-year field experiment was conducted at the Study and Research Farm "Peterlauki" on silt loam brown lessive soil. Three varieties of winter wheat (*Cubus*, *Tarso*, *Zentos*) in 4 sowing times with a 10-day interval from the end of August till the end of September with 3 sowing rates – 300, 400, and 500 germinating seeds per m^2 with four replications were included in the experiment. Certified treated seed material was used. The depth of sowing was 3 to 4 cm. Fertilizer treatments: preplant application of P_2O_5 - 60 kg ha^{-1}, K_2O - 90 kg ha^{-1}, split nitrogen topdressing N 150 kg ha^{-1} – in spring after renewal of vegetation N 90, and N 60 kg ha^{-1} at the beginning of stem elongation stage of plant growth.
The 3-year research results indicate that all the varieties of winter wheat included in the experiment showed higher (8.5 – 9.4 t ha^{-1}) and more stable yields between years in treatments with sowing time performed in the second half of September, i.e. in the third and fourth sowing time. Earlier planting dates, particularly at the end of August, regardless of the sowing rate resulted in vigorous tillering, the strong outgrowing of plants and the occurrence of snow mould in spring, causing the death of plants. Winter wheat *Tarso* was more stable regarding sowing time but more sensitive was *Cubus*.The sowing rate was not the yield determinant factor. Only in late sowing (the 4^{th} sowing time at around 29 – 30 September), when plants with none or extremely poor tillers were going to overwinter, increased sowing rate showed the tendency of yield increase.

Key words: inter wheat, variety, sowing time, sowing rate

Introduction

Winter wheat is one of the most productive and significant cereal species in Latvia used for food grain production. For that reason, the average grain productivity level in Latvia and grain supply both for food and feed is greatly dependent on the grain yield of winter wheat and yield stability between years. As known, the grain yield and quality of winter wheat are dependent on corresponding agro-technical measures - complex provided for a variety grown in a definite region under variable meteorological conditions. Optimal sowing time and a corresponding sowing rate have a significant role in common agro-technical measures complex to establish in autumn a healthy sward capable of wintering under inconsistent winter conditions. Current assumptions regarding sowing time and sowing rate under conditions of Latvia are based mainly on research results obtained in 70ies-80ies of the last century (Adamovičs, 1978; Bonāts and Sīviņš, 1987; Sēklkopja rokasgrāmata., 1967). As recommended in books (Jurševskis, 1988; Grīnblats, 1985) and