

1. Filipiak K. – Synthetic parametr of soil fertility7

Abstract

In the paper, the concept of a synthetic index of soil fertility is presented. This index includes six soil characteristics measured by agrochemical laboratories in Poland. These are soil pH, granulometric composition of soil, humus content and the contents of available forms of phosphorus, potassium and magnesium. The values of this index were calculated by factor analysis, using data from soil monitoring collected in the data base MONGOS. The values of the index were split into five groups of soil fertility. Verification of the new factor has been made by analysis of variance against the crop yields and the individual soil characteristics. Both approaches prove the validity and usability of this factor. The results of investigations pose a novelty in the literature concerning soil agrochemical properties.

Key words: synthetic factor of soil fertility, agrochemical soil properties, soil monitoring

2. Fotyma M. – Calibration of soil test for available potassium17

Abstract

In the paper, the new approach to calibration of soil test of available potassium according to Egner-Dl method is presented. This test has been calibrated against the amount of potassium soluble in water. Water soluble potassium reflects better the ability of soil to provide crops with this element. The new calibration figures for Egner-Dl potassium are calculated. Generally, the new figures are lower in comparison to the used ones. The recommended potassium rates based on new figures should be therefore, lower as well.

Key words: available potassium, calibration of potassium soil test, Egner-DL method, potassium soluble in water

3. Fotyma M., Pecio A. – Spatial variability of soil fertility and productivity within the production field26

Abstract

Paper presents the selected results of the investigations carried on since 1997 with the method of scientific observations on the 50 ha big field in the Experimental Station Baborowko (near Szamotuły) belonging to the Institute. The experimental field has been split into three plots on which winter rape, winter wheat and spring barley were grown in succession. On the whole field 403 observation points have been permanently marked using GPS device. In these points, every third year, the soil samples were collected from the plow layer. These samples were analyzed for pH, soil organic matter SOM and the content of available phosphorus, potassium and magnesium. Soil map has been drawn in the scale 1:500 and in the samples granulometric soil composition was estimated with laser method. Crop yields have been harvested by combine harvester provided with continuous yield meter and GPS device. The yield map prepared by combine computer was approximated to the yield in the observation points. In the paper, the results concerning soil analysis performed in 2008 years and the average yields of crops for the years 2000-2002 are presented. The main aim of the investigations was to calculate the relation between soil properties and the relation between soil properties and the crop yields. It is the preliminary approach to make the maps of fertilizer rates with recognition of variation of soil properties within the experimental field.

Key words: soil variability, scientific observation, site specific fertilization

4. Jadczyzyn T.– Calculation of fertilizer P, K, Mg rates in precision agriculture43

Abstrakt

The research was carried out in Experimental Station Baborowko for several years with the aim to recognize spatial variability of agrochemical properties of soils as well as spatial and temporal variability of yielding of plants. Collecting such data in geographical information system (GIS) is one of the stages of precision agriculture. The next step of the system is elaboration of the maps of fertilizers application. The doses of phosphorous, potassium and magnesium fertilizers were calculated on the basis of spatial variability of macronutrients content in soil and changeability of plants yield.

Quantity of fertilizers used in compliance to the precision agriculture and according to traditional recommendation system (average dose of fertilizers for the whole surface of the field was compared. It was affirmed that the consumption of fertilizers in both systems was very similar, however the differentiation of fertilizers doses in conditions of SD Baborowko were quite meaningful

Key words: site specific fertilization, variability of fertilizer rate, fertilizer utilization

5. Kęsik K., Zarychta M., Krasowicz S. – Fertilizer rates applied in agricultural practice against the rates resulting from official fertilizer recommendations51

Abstract

In the paper, the results of investigations carried out in the years 2001–2003 in Polish market farms by a questionnaire are presented. Questionnaires concerning 4483 fields of spring cereals, wheat, barley, oats and cereal mixture have been collected. Fertilizer rates applied by farmers were compared with those recommended by the official fertilizer recommendation system NawSald. The applied rates of nitrogen and phosphorus fertilizers were higher by about 17 kg N and P₂O₅ per ha and potassium fertilizers by about 10 kg K₂O ha⁻¹ than the recommended ones. Too high rates of nitrogen have been applied on 40% analyzed fields and too high rates of phosphorus and potassium on 44% and 36% fields, respectively. Too low rates of nitrogen and phosphorus were applied on 10% of fields and potassium on 16% of fields.

6. Kocoń A. – Gas exchange in leaves of varied faba bean and pea cultivars in water deficit conditions98

Abstract

The paper presents results of the experiment on the gas exchange in leaves of varied faba bean and pea cultivars grown in water deficit conditions. The pot experiments were conducted in 2004 – 2006 in the greenhouse belonging to the Institute at Puławy. The following parameters of gas exchange of leaves were considered: the net photosynthesis rate, transpiration rate, stomatal conductance and water use efficiency – WUE. It was shown that water deficiency in soil decreased the gas exchange of investigated pulses. Both in optimal and in deficit water condition traditional cultivars of plants were characterized by better gas exchange parameters and water use efficiency in comparison to the new cultivars, i.e. determinate type of faba bean and narrow-leaved form of pea.

7. Kopiński J., Matyka M., Ochal P., Igras J. – Trends in the changes in use the mineral fertilizers in Poland108

Abstract

The paper presents an assessment of ongoing changes in the consumption of mineral fertilizers and limestone in Poland in last years. The changes in the commodity structure and balance of mineral fertilizers are discussed. In the last years the growth trend of mineral fertilizer consumption in comparison to 2001-2003 years was noted in all regions of the country. However, dynamics of these changes differs between the regions. Very unfavorable process is a drastic decline in consumption of limestone resulting in progressing of soil acidification.

Key words: regional differentiation, mineral fertilizers, fertilizer consumption in Poland.

8. Kopinski A., Tujaka A. – Nitrogen, phosphorus and potassium balance in Polish agriculture in the years 2005 – 2009120

Abstract

In the paper, the balances of nitrogen, phosphorus and potassium, made for the years 2005-2009, by the soil surface method at the national and regional level are presented. The balance differences calculated for each region in Poland, provide the important information on the efficiency of nutrient management, and environmental consequences of fertilizer application. On this base, it is possible to identify areas characterized by surpluses or deficiencies of a particular nutrient.

Key words: nutrient balances, regional differentiation, agro-environmental indicators

9. Pecio A. – Interaction of nitrogen and plant protection against fungal diseases in intensive cereal crop production133

Abstract

The purpose of the study was the estimation of the effect of nitrogen fertilization on grain yield of winter wheat, spring barley, winter triticale and oat under conditions of differentiated chemical plant protection strategy against fungal diseases. The study was realized in Grabow Experimental Station of the Institute of Soil Science and Plant Cultivation on the base of long term experiment in 2004-2007. The strategy of chemical plant protection proposed by three companies: Syngenta, DuPont and BASF and control treatment without protection was the first experimental factor. Nitrogen rate 0, 40, 80, 120, 160 (for winter wheat) and 0, 30, 60, 90, 120 (for spring barley, winter triticale and oat) was the second experimental factor. The results showed that maximization of cereal crops productivity is possible only under weather conditions appropriated for demands of specific crop and intensive nitrogen fertilization. Effectiveness of nitrogen fertilization and chemical plant protection is related to the schedule of weather conditions during vegetation period. The simultaneous effect of nitrogen fertilization and chemical plant protection of winter wheat, spring barley and winter triticale is cumulative or combine, dependent on the pattern of weather conditions. The effect of both factors on oat grain yield is combine. The plant protection strategies proposed by Syngenta, DuPont and BASF companies did not differentiate grain yield of wheat and oat. The strategies of BASF and DuPont were the most effective for grain yield of barley and triticale.

Key words: cereal crops, nitrogen fertilization, plant protection strategy, grain yield

10. Pecio A., Mikołowicz P. – Comparison of destructive and non-destructive methods of estimation the winter wheat nutritional status146

Abstract

The results of field and laboratory investigations carried out in the years 2005– 2009 in two Experimental Stations belonging to the Institute of Soil Science and Plant Cultivation at Pulawy, Poland are presented. The study was realized in scope of NUTRIMET project financed by the Ministry of Science and Higher Education. It considered four plant tests for evaluation the nitrogen nutritional status of winter wheat: nitrogen concentration N_{tot} in plant dry matter, NNI index, SPAD index and NDVI index. The tests were performed at stem elongation stage and anthesis of winter wheat. The calibration runs against the relative grain yield, optimal dose of nitrogen, N_{crit} and the NNI index. The NDVI test was performed by the unique in Poland instrument Green-Seeker™. Destructive N_{tot} and NNI tests and non-destructive SPAD index showed full usability for estimation the winter wheat nitrogen nutritional status. The critical values for N_{tot} and SPAD tests and the preliminary value for NDVI test have been found. In the second part of the study, the stability of the plant tests during the vegetation period was checked. The hypothesis that the selection and calibration of plant tests should be focused on the plant growth (accumulation of dry mass) instead of on the plant development (the growth stages) has been confirmed. The best plant test, which values depend only slightly on the accumulation of plant dry matter proved to be NNI, hence confirming the sound theoretical basis underlying this test. The next test was SPAD, reasonably stable throughout the whole vegetative period of plant growth. Nitrogen concentration in dry mass, N_{tot} and NDVI index changed considerably along with accumulation of plant dry matter and do not fit to the above hypothesis.

Key words: Winter wheat, plant tests, N_{crit} , NNI, SPAD, NDVI

11. Pecio A., Niedźwiedzki J., Martyniuk S., Kubsik K. – Indices of agrophysical and agrochemical soil fertility under different tillage and fallowing169

Abstract

The studies were conducted in the years 2005-2007 on production fields at Baborowko Experimental Station belonging to the Institute of Soil Science and Plant Cultivation in Pulawy, Poland. The purpose of the study was to determine environmental consequences of soil tillage and fallowing systems differing in intensity and depth of soil management. Soils within the same field were numbered among three textural groups, very light, light and middle. The influence of soil tillage systems on the physical, chemical and biological soil properties depended on a soil category. On the very light soils giving up plough improved soil physical and chemical properties and decreased biodiversity. On light soils decreasing of tillage depth worsened physical but improved chemical and biological soil properties, including humus content and enzyme activity. On medium soils all soil parameters as well as biodiversity of aboveground fauna has been improved under the influence of reduced tillage.

Key words: depth of soil tillage, soil physical properties, soil chemical properties, biodiversity.

12. Pi kuła D. – The yield of winter wheat depending on weather and nitrogen supply
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Abstract

The paper presents results of the permanent field experiments carried on in the years 1999 – 2009 at Experimental Station Grabow on the yielding of winter wheat. In two-factorial experiment the first factor was two crop rotations, with and without leguminous crop and the second one five levels of farmyard manure applied for potato, starting four-crop rotation. For winter wheat, independently of manure fertilization the rate of 100-120 kg N ha⁻¹ has been applied. Hydrothermal (Sielianinow) index was used for characterization the weather conditions in the years of the experiment. The yield of winter wheat grain depends significantly on hydrothermal conditions in April and July. The surplus of precipitation in July reduces considerably the grain yield. Manure, applied in the rate above 20 t ha⁻¹ every fourth year did not influence the winter wheat yield. There was no significant interaction between manure rates and the course of weather in the years of the experiment.

Key words: four-course crop rotation, nitrogen fertilization, manure application, winter wheat, hydrothermal (Sielianinow) index.

13. Pi kuła D. – The yield of spring barley depending on weather and nitrogen supply
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Abstract

In the paper, the results of the permanent field experiments carried on in the years 1999 –2009 at Experimental Station Grabow, on the yield of spring barley are presented. The factors in the experiment were two, four-course crop rotations, with and without leguminous crop, and five levels of farmyard manure applied for potato. The rate of 60-80 kg N ha⁻¹ has been applied for barley, independently of rotation and manure application. Hydrothermal (Sielianinow) index was used for characterization of weather conditions during the experiment. The yield of barley grain depended significantly on hydrothermal conditions in May and June. The deficit of precipitation in this month reduces considerably the grain yield. Manure, applied in the rate above 20 t ha⁻¹, each fourth year scarcely influenced the barley yield. The significant interaction between manure rates and the course of weather in the years of the experiment has been observed.

Key words: four-course crop rotation, nitrogen fertilization, manure application, barley, hydrothermal (Sielianinow) index

14. Rutkowska A. – The consequences of unbalanced fertilization with nitrogen, phosphorus and potassium in four-course crop rotation.....209

Abstract

In the paper, the consequences of long lasting soil depleting from phosphorus and potassium under different nitrogen rates were presented. The field experiments were carried on in 2003–2009 in Experimental Station Grabow and Baborowko of IUNG-PIB in four – crop rotation: winter rape – winter wheat – maize – spring barley. The soils in both sites were classified as loamy and sandy – loam. In two factorial experiments the first factor was P and/or K and the second one N fertilization. P and/or K was either applied or abandoned and N fertilizers were applied in six consecutive rates. The long term of unbalanced mineral fertilization affected more the soil fertility measured by phosphorus and potassium contents than the plant yields. Potassium uptake by crops was strongly related to nitrogen rates. That implies the necessity of fitting the K rates to soil fertility, potassium requirements of crops and predicted nitrogen rates.

Key words: soil depleting from phosphorus and potassium, nitrogen fertilization, soil indexes, plant indexes