

Biogeochemistry of potassium in agricultural systems of Central-Eastern European countries , editor Fotyma M.

Syers J.K. Soil and plant potassium in agriculture (A review)str. 9

Abstract

Potassium (K) is an essential nutrient for plants and animals, including humans; its role in agricultural production is firmly established. Also, K constitutes no hazards to human health and has no deleterious effects on water quality. It is highly unlikely that the world's supply of high quality K sources will be exhausted within the next few centuries. The needs and opportunities for further work on K in agriculture relate to economic issues, particularly improved recommendations for K fertiliser use. To achieve this a better understanding and integration of the relevant soil and plant factors is required. The chemistry of K in soils is relatively simple, compared to that of nitrogen and phosphorus. Exchangeable K is a good indicator of soil K status and the likelihood of obtaining a response to K fertiliser in many soils. However, for soils containing partially weathered micaceous minerals, fixed K (which is slowly available) is a potentially important source of K for crops. Work in the United Kingdom in the 1950s and 1960s emphasized the likely significance of fixed K (often referred to as non-exchangeable K) as a source of K for crop growth. As exchangeable K levels have been built up and the likely contribution of fixed K has diminished, this interest has waned but it would be worth reconsidering the relationship between non-exchangeable K and initially exchangeable K in soils where mineralogical composition is known. This is because it may be possible to moderate exchangeable K values, based on an estimate of the supply of fixed K, in developing more precise fertiliser recommendations for K. Expressing plant K concentrations for cereals on a tissue water basis provides essentially constant values for K concentration which are little affected by fertiliser N and P and water supply. This method offers promise for diagnosing K deficiency for these crops but commercialisation of the possibility has been slow. Foliar application of K has produced very positive results in some experiments but further work is required for this method of application in specific situations, such as high magnesium soils. Crop offtake of K has increased substantially in recent years as yields have increased and more straw has been removed. Fertiliser recommendations for K are being modified accordingly. Modelling offers the best prospects for improving our understanding of the dynamic interactions between the soil supply of K and crop demand for K. There have been advances in modelling the uptake of K by crops but there is a shortage of data to validate

such models. To find widespread acceptance at the field level, such mechanistic models require a better integration between the soil and crop components, simplification, and validation.

Astover A., Roostalu H., Tamm I., Vingisaar V. Potassium balance of arable soils in Estonia, str. 37

Abstract

The aim of the present study was to assess potassium balance in the soils of Estonian arable land over time and to characterize, on the basis of the research results obtained in Estonia, the processes involving potassium in agricultural systems. In the 1970s–1990s, the potassium balance of arable soils in Estonia was significantly positive. Owing to the notably positive balance of plant nutrients the amounts of lactate soluble potassium increased 0.7 mg kg⁻¹ soil per year. At present, potassium balance has become negative. As a result of the political and social-economic reforms in the early 1990s, potassium input for arable land decreased 19 times for mineral fertilizers and 4 times for organic fertilizers. From mineral fertilizers, plants utilize 60-80% of potassium per rotation. Regarding manure, plants assimilate 50-70% of potassium in the first year with a total of 70-80%.

Key words: potassium balance, fertilization, efficiency, regional analysis

Barszczewski J., Sapek B. Potassium balance of a sprinkled irrigated permanent meadow, str. 46

Abstract

The experiment was carried out on a meadow with active sprinkle irrigation through 16 years. Different fertilizer rates were applied from 60 to 298 kg K•ha⁻¹. Potassium was used in two forms - mineral and urine. Three investigation periods have been used, each with different potassium rates. Potassium balance, plant yield and potassium content in soil (0,5 M HCl extract) were made for each investigation period. A negative balance of potassium was observed. The main factor that influenced balance of potassium in the soil was yield of grass. Increase of potassium content in following layers up to 100 cm by lower level of fertilization depends on usage of potassium stored in the soil and its washing out.

Keywords: mineral fertilization, sprinkled irrigation, potassium balance, meadow

Cermak P., Budnakova M. Potassium content in the soils and potassium balance in the Czech agriculture, str. 57

Abstract

The low level of mineral fertilizing in the Czech Republic has a negative influence on the content of available nutrients in the soil and yields of growing crops. According to results of soil testing and results of long-term field experiments provided by Central Institute for Supervising and Testing in Agriculture (CISTA) it is evident negative balance of essential nutrients, including potassium, in the Czech agriculture. This state is not constantly sustainable and it's very important to increase basic inputs to the soil in form of fertilisers (mineral and organic).

Key words: nutrients, inputs, potassium, soil testing, balance, sustainable agriculture

Filipek T., Bojarczyk M. The content of nutrients and trace elements in Ukrainian kainite distributed in South-East Poland, str. 69

Abstract

The investigations concerned kainite imported from the Ukraine and distributed in the south-east part of Poland. The content of potassium, magnesium, sodium, calcium, manganese, zinc, copper, nickel, lead, cadmium and chromium in samples of fertilizers was determined with Atomic Absorption Spectrometry (AAS) method by flame or furnace version in dependence on the element concentration in solution. The kainite can be considered as potash-magnesium-sulfur fertilizer K-Mg-S which contains also substantial amounts of sodium and chlorine.

Key words: kainite, nutrients, potassium, trace elements.

Gorbanov S., Tomom T. Potassium balance in 40 years field experiment in crop-rotation system i, str. 76

Abstract

Experiment with different systems of mineral and organic-mineral fertilizers in field crop rotation with grain cultures (maize, wheat and barley) on a meadow slightly saline soil was carried out. The effect and after-effect of the potassium, phosphorus and nitrogen on the potassium balance and on the crop productivity was studied. In all the investigated systems of the fertilization the potassium balance has always been negative. The K-utilization coefficient from K-fertilizers by systematic use of K-fertilisers is 65- 75%. But in the case of not using K-fertilizers during the last 12 years the K-coefficient is 100%.

Key words: long term experiment, potassium balance, systems of fertilization

Karklins A., Lipenite I. Potassium balance in selected farms of Latvia, str. 81

Abstract

Potassium soil surface and farm gate balances were calculated for each test year as well as average for 5-year period in selected commercial farms of Latvia. Mixed farming system with different ratio between crop and animal husbandry was the main feature for these farms. Accounting of farming operations and all potassium inputs – outputs were performed during 1999 – 2003. Negative potassium balance on field level in the range of 13.5 – 29.4 kg ha⁻¹ K₂O had been found in four of six test farms. Potassium in crop residues and by-products left on the field were not included in the output part of Soil surface balance. Alternatively potassium Farm gate balance was positive for all farms. Surplus varied from 7.8 to 58.2 kg ha⁻¹ K₂O and depended ($r = 0.94 - 0.99$) on amount of potassium fertilizers purchased for annual application.

Key words: potassium, commercial farms, Soil surface balance, Farm gate balance

Nikolova M.T. Potassium balance on field, farm and country level in Bulgaria, str. 89

Abstract

With the present study a potassium balance is drawn up, for the first time in on a farm and regional scale in Bulgaria. It is calculated for a three years period for all regions in the country and for selected typical for a given type farms. The results show that potassium balance in Bulgaria is negative at soil, farm gate, regional and national levels. The exception is observed at the dairy farms, because of low K-output. Those farms are only a small part of the farms in the country. The mean annual deficiency is high and amounts to 64 kg K₂O per ha. The reason for the deficiency is the rather low potassium fertilization. Continuing potassium deficiency in agriculture deteriorates the soil fertility. The share of the soils with low potassium status increased.

Key words: Potassium balance, potassium deficiency, potassium removal, potassium input, potassium output.

Torma S. Potassium balance in agriculture of Slovak Republic in the years 1989 – 2003, str. 98

Abstract

Potassium fertilizers consumption in Slovakia is on the level of 5-10 % in comparison with the eighties. It means that it was applied only 6-8 kg K₂O per hectare of farmland in recent six years, while in 1989-90 it was 80-100 kg. The strong reduction of potassium fertilizers consumption since 1992 has caused that the potassium balance (the difference between potassium input with both mineral and organic fertilizers and potassium output with harvested crops) in agricultural soils in Slovakia shows serious deficiency. The potassium losses reach about 50 kg K₂O per hectare per year. However this value does not need to be the right one because the inaccuracy in calculation of potassium balance results from (i) potassium contents in harvested crops, (ii) potassium contents in organic fertilisers, (iii) potassium losses from organic fertilisers, (iv) potassium losses due to water erosion and (v) the ratio between main product and by-product of crops.

Key words: potassium fertilization, potassium balance

Dlugosz J., Szychaj-Fabisiak E., Malczyk P. – Spatial differentiation of available potassium content in the soil surface horizon from selected area Sepopolska Plain , str. 105

Abstract

The objective of the study was to show spatial differentiation of available potassium in the surface horizon of arable soils of various textures with the use of geostatistical methods. The investigations were done on samples collected from a field (50 ha) located on the Sepopolska Plain. Available potassium was assayed with Egner-Riehm method. The maps were drawn with the use of Surfer software after transformation of the data by kriging. The results showed a considerable differentiation of the analysed surface horizon according to the available potassium concentration (144 – 466 mg·kg⁻¹).

Key words: available potassium, geostatistical methods, map of available potassium content, potassium abundance classes

Fotyma M., Gosek S., Straczyk D. New approach to calibration of the Egner-Riehm(DL) soil test for available potassium ,str.113

Abstract

In the paper the preliminary results of soil testing in lubelskie voivodship for the content of water-soluble and available (Egner-Riehm DL) KDL potassium are presented. In 2003/2004 700 samples from the plough layer and subsoil were collected and analysed for different potassium forms. The content of potassium in water KH₂O (soil/ water ratio = 1/5) was recalculated in the potassium concentration in soil water K_{con} (assuming saturation to full water capacity). A very close correlation was found between KDL and K_{con} and the slopes of the regression lines were strongly dependent on soil texture. On the base of this relation the validation of the KDL soil test was proposed.

Key words: water-soluble soil potassium, Egner-Riehm DL soil test, calibration of potassium soil test

Fotyma M., Gosek S., Straczyk D. The content and relations of different forms of potassium in the soils of Lublin Region, str. 124

Abstract

In the paper the results of soil analyses in Lublin Region for the contents of watersoluble KH₂O, available (exchangeable) KDL, K_{ex} and fixed (non- exchangeable) K_{nonex} potassium are presented. For this purpose soil samples in 700 sites were collected from the plough layer and subsoil and analysed for the granulometric composition and different forms of potassium by standard methods. Available potassium makes 20-40 % of the fixed one and water-soluble potassium 10-30% of the available form, depending on soil layer and soil texture. The contents of all forms of potassium were twice so high in plough layer than in the subsoil. The content of KH₂O does not depend on soil texture while the contents of other form increased from the very light to heavy soils. The strongest correlation was found between K_{ex} and KDL, weaken but significant between KH₂O and K_{ex},DL and K_{ex},DL and K_{nonex} and the weakest between KH₂O and K_{nonex}.

Key words: potassium in soils, forms of soil potassium, water-soluble potassium, exchangeable potassium, fixed potassium

Füleky G. Exhaustion of available soils potassium, str.133

Abstract

The soil potassium supply changes in case of exhaustive plant uptake. It is the situation at negative potassium balance. When the plants are well supplied with solution and exchangeable potassium forms or from fertiliser, the plants take up these forms. When plant potassium uptake is exhaustive, at low solution and exchangeable potassium content, the plant uptake becomes more significant from the non-exchangeable source. For the two experimental soils, which had very similar physical and chemical properties, the potassium balance in the soils of a pot experiment gradually became negative, after which the AL-soluble K content no longer decreased, but exhibited a constant value of around 120 mg kg⁻¹. This indicates that the non-exchangeable K reserves of the soil play an important role in crop nutrition when the K balance becomes negative.

Key words: potassium, exchangeable potassium, non exchangeable potassium, EUF

Grzywnowicz I. Changes in amount of non exchangeable sorption of potassium in various soils depleted of this element, str.141

Abstract

Basing on exchangeable potassium content and bulk density of soils in individual genetic horizons a reserve of potassium available to plants was computed in soils formed from loess and loess-like deposits to the depth 100cm. Exchangeable potassium occurring in the arable layer of the researched soils constituted between 31.5 and 58.9% (mean 47.4%) of the potassium quantity in genetic horizons of the analysed soils to the depth of 100 cm. Literature data show that cereals, due to development of their root system may with depth take up on an average c.a.19% of potassium from sub-arable layers. Therefore potential of these soils for supplying cereals in potassium are much wider than its possible uptake by the plants.

Key words: Exchangeable potassium, potassium in subsoil

Grzywnowicz I. Possibilities of potassium uptake by plants from deeper layers of soil profile, str. 149

Abstract

Basing on exchangeable potassium content and bulk density of soils in individual genetic horizons a reserve of potassium available to plants was computed in soils formed from loess and loess-like deposits to the depth 100cm. Exchangeable potassium occurring in the arable layer of the researched soils constituted between 31.5 and 58.9% (mean 47.4%) of the

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Key words: Exchangeable potassium, potassium in subsoil

Igras J., Dante V. Potassium balance on farms in the Lublin Region, str. 156

Abstract

Paper presents potassium content of grasslands soils of mountain Ujszoły commune, situated in southern part of Beskid Żywiecki (with altitude 540-1324 m a.s.l., in a strongly formatted terrain with a slope reached 30-50°), on a background of their properties. A majority of analyzed grassland soils from the Ujszoły commune belonged to heavy ones and all of them were excessively acidified (pH <4.5). The content of organic matter and CEC of soils were relatively high. Hydrolytic acidity share in CEC did not exceed 40% what points to weak degradation of the environment. The soils were characterized by low content of total potassium and very low available K content and by small portion of available K forms in its total content. It may testify extreme soil depletion of this element and limiting or discontinuing K fertilization in this area. Available potassium content in soil was positively correlated with its total amount and both of these forms contents were positively correlated with clay content in the soil. The contents of both forms were positively correlated with potassium content in grassland sward.

Key word: grassland, mountain region, soils, total K, available K

Wisniowska-Kielian B., Niemiec M.– Potassium content in grassland soils on an example of mountain commune Ujszoły, str. 162

Abstract

Paper presents potassium content of grasslands soils of mountain Ujszoły commune, situated in southern part of Beskid Żywiecki (with altitude 540-1324 m a.s.l., in a strongly formatted terrain with a slope reached 30-50°), on a background of their properties. A majority of analyzed grassland soils from the Ujszoły commune belonged to heavy ones and all of them were excessively acidified (pH <4.5). The content of organic matter and CEC of soils were relatively high. Hydrolytic acidity share in CEC did not exceed 40% what points to weak

degradation of the environment. The soils were characterized by low content of total potassium and very low available K content and by small portion of available K forms in its total content. It may testify extreme soil depletion of this element and limiting or discontinuing K fertilization in this area. Available potassium content in soil was positively correlated with its total amount and both of these forms contents were positively correlated with clay content in the soil. The contents of both forms were positively correlated with potassium content in grassland sward.

Key word: grassland, mountain region, soils, total K, available K

Kobierski M., Dabkowska-Naskret H.– Potas w zróżnicowanych typologicznie glebach Równiny Inowrocławskiej, str. 172

Abstract:

The study was undertaken in order to determine potassium content and forms in arable soils of Inowrocław Plain, formed from glacial till. Eight representative soil profiles have been selected for the investigation. Profile distribution of total potassium ranged from 15500 to 23600 mg·kg⁻¹, exchangeable potassium were in the range 39,1 to 625 mg·kg⁻¹ available potassium 19,2 – 357 mg·kg⁻¹ and water – soluble potassium from 3,8 up to 215 mg·kg⁻¹. The highest content of available potassium was observed in upper soil horizons, due to fertilization as well as weathering of soil minerals. Mineralogical composition of clay fraction indicates that mobile potassium is fixed in nonexchangeable forms in smectite structures. The above process lead to the formation of illite minerals. XRD results confirm the high amounts of illite and illite/smectite minerals in upper soil horizons compared to parent material.

Key words:

Lipinski W., Walendziak M. Available potassium content in Polish soils ,p. 182

Abstract

This paper presents the results of tests for potassium richness in soils, obtained as part of the analyses performed by chemical and agricultural stations for the sake of fertilizer recommendations on arable land in Poland. The tests for potassium content in soil are carried out using the Egner-Riehm (DL) method and in 0,5 mol HCl . dm⁻³, and the results take into account agronomic categories of the soil and are evaluated using the 5-grade scale.

Key word: available potassium, studies of soils

Murawska B., Sychaj-Fabisiak E. Modeling the contents of available forms of potassium in soil in relation to the use of fertilization and crop rotation ,p.189

Abstract.

The aim of the studies was to compare the long-term effects of different systems of fertilization in the crop rotation on the mobility of potassium and its balance in light soil. Fertilizers applied in the integrated system (manure + straw + NPK) caused higher increase of the content of available potassium in soil (0-20 cm) than mineral fertilizers. From the balance of potassium it can be concluded that in system with mineral fertilizers potassium is released from its non-available forms. In the integrated fertilization system potassium not taken by plants was, however, immobilized or moved into deeper layers of the soil profile.

Key words : available potassium, potassium balance, mineral fertilization, integrated fertilization

Sapek A. Potassium concentration in groundwater from the different used peat soils,p.. 206

Abstract

The potassium behavior in peat soils was investigated on the basis of its content in soil, soil solution as well as in surface- and groundwater. The investigations were carried on natural or extensive farmed soils in Biebrza National Park and on soils used as grassland for intensive dairy production. The potassium content in investigated peat soils was low, what was reflected in the rather low concentration of this nutrient in surface- and groundwater. The highest concentrations were observed in summer and early autumn, though only on objects fertilized with potassium. The potassium concentration in groundwater was significant correlated with the concentrations of phosphate and ammonium. The expected maximal potassium leaching from fertilized peat soil would be in the range from 10 to 40 kg K ha⁻¹ y⁻¹.

Key words: potassium, peat soil, groundwater, soil solution

Sapek B. Potassium concentration in ground water from under the farmstead and its vicinity, p 219

Abstract

The effect of farming intensity was studied on the concentration of potassium in ground water from under the farmstead and its nearest vicinity. Correlation between potassium concentration and some other components, particularly dissolved organic carbon (DOC), was evaluated. High potassium concentrations in groundwater are a result of infiltration of this element from animal manure storage and from ensilage silos, particularly when the latter are improperly constructed. Potassium concentrations, as those of nitrogen and phosphorus, are a measure of agricultural impact on the environment and water quality. Pollution of ground and surface waters near the farmstead is accompanied by high concentrations of DOC, which could also be an indicator of agricultural effect on the environment of rural areas.

Key words: ground water, potassium concentration, dissolved organic carbon, farmstead, demonstration farms.

Spychalski W., Mocek A., Gilewska M. – Potassium form in soils formed from postmining lands ,p.. 230

Abstract

The paper outlines the content of different forms of potassium in soils formed from postmining lands and under differentiated levels of fertilization and crop rotation after a period of twenty five years of land reclamation. Amounts of all potassium forms increased systematically with increasing the level of fertilization and the share of particular potassium forms was as follows: K-H₂O < K-Egner < K-exchangeable < K-retrograded < K- ready reserve pool < K-unavailable reserve pool. Less potassium was found in soils under the fodder crop rotation as compared to the oil seed rape-cereals crop rotation after twofold of NPK application (i.e. 2 NPK treatment).

Key words: Forms of potassium, fertilization, crop rotation, postmining lands

Stępień M., Mercik S. The regenerative effect of FYM on soils depleted from potassium and strongly acid , str. 242

Abstract

In the paper the crop yields, K-uptake by crops and content of available and exchangeable potassium in soil, in 2000- 2002 years are presented. The study was carried out on plots of

permanent experiment established in 1923 with very differentiated pH values and potassium available content in soil. Since 1923 till 1991 all plots were not manured, and no legumes were grown on them. After 1992 the half of plots continued without manure, while on the second half the farmyard manure was applied four or five times. Application of the farmyard manure diminished negative effects of the strong acidification of soils and potassium deficiencies. Such effect was bigger on unlimed soils than on limed ones.

Key words: permanent experiment, FYM application, pH of soil, potassium in soil, plant yields.

Szara E., Stępień W., Mercik S. Content of different forms of K and exchangeable forms of Ca, Mg and Al in dependence on long term fertilization with these elements , str. 253

Abstract

The aim of this study was to estimate, the effect of long-term fertilization (since 1974) with potassium depending on liming and magnesium fertilization on the content of chosen forms of K and exchangeable forms of Ca, Mg, Al in soil to 75 cm depth. The amount of K extracted by 1 mol CH₃COONH₄ was 2 times higher than K extracted by 0,01mol CaCl₂ solution and 3-4 times lower than K extracted by 1 mol HNO₃. The amounts of all potassium forms were lower in Eet horizon than in Bt and Ap. The content of exchangeable forms of Ca, Mg and Al were depended mainly on liming and less on fertilization with Mg and K.

Key words: long-term experiment, forms of potassium, exchangeable cations.

Szymańska M., Labetowicz J., Korc M. Estimation of the form of potassium affected by fertilization factors in longterm fertilization experiment., str. 262

Abstract

On the grounds of the results of many-year fertilization experiment, the effect of individual fertilizing components: nitrogen, potassium, phosphorus, and of liming and manure fertilization on the level and rate of accumulation forms of potassium in the light soil, was evaluated. The greatest influence on accumulation of all forms of potassium was by application of manure (except the reserve potassium).

Key words: potassium forms, long term field experiment, fertilizers.

Barszczewski J. Potassium fertilization on grasslands in the process of achieving sustainable management, str. 272

Abstract

Based on long term studies in sites differentiated in soils and water regime, the recommendations were elaborated in the Institute for Land Reclamation and Grassland Farming for fertilisation of grasslands situated on mineral and organic soils. Presented paper describes three extreme sites for each soil type and compares fertilisation and yielding of meadow and pasture in dry ground site. In the farm, manure was applied every second year on meadows supplemented with mineral K fertilisation. Fertilisation was controlled through balances in meadow and pasture. Moreover, utilisation and surplus of fertiliser in the whole farm were controlled with the method of balance at farm's gate. Increasing application of manure during the changes in the farm resulted in reduced potassium surplus.

Key words: potassium fertilisation, manure, recommendation for fertilisation, meadow, pasture

Brogowski B., Gawronska-Kulesza . A potassium content in growing stages of selected crops, str. 283

Abstract

The purpose of this investigation was to study the amounts of potassium content in some cereals plants, potatoes, sugar beets and winter rape. It was found that the highest amounts of potassium occurred in plants early in spring, in tillering growing stage. During growing of dry matter of plants the amounts of potassium is decreasing systematically until the full ripeness. The share of this element both in sum of cations (Ca+Mg+K+Na) as well as in the sum of all macronutrients (Ca+Mg+K+Na+P+N) in most crops is growing slowly up to end of vegetation stage.

Key words: potassium, sugar beet, potatoes, cereals.

Ciepiela G.A., Jankowski K., Jodelka J., Kolczatek R. Content of potassium in three grass species subject to dose and nitrogen form of nitrogenous fertilizers, str. 294

Abstracts

The aim of the research was to determine the influence of a nitrogen dose and forms of a nitrogen fertilizer on a potassium content as well as on the K: (Ca + Mg) ratio in three grass species. In the period of 1997 – 2000 the field experiments were carried out in the

Agricultural Research Station in Zawady. The research was conducted on *Dactylis glomerata*, *Bromus unioloides*, *Lolium perenne*, cultivated as in a monoculture on the black earth soil. The experiment was carried out in four replications, and in the split – split – plot arrangement. The second and third regrowths, were fertilized in two ways: through foliar fertilization, using a double urea solution in quantity 300 dm³ ha⁻¹, and through top – dressing, with ammonium nitrate in a solid form. In order to compare the efficiency of nitrogenous fertilizers subject to their physical form, the quantity of nitrogen in the applied doses of ammonium nitrate was balanced with its quantity contained in the urea solution.

Key words: potassium, foliar fertilization, grasses, K : (Ca +Mg) ratio, hay

Dana D., Dorneanu E. , Dorneanu A., Timbota I., Povarna Fl., Clotan Gh., Serdinescu A., Calinoiu I. Efficiency of different potassium fertilizers on some field crops in Romania , str. 301

Abstract

The potassium fertilizers were tested in field experiments, for three years, on different soils, poor in potassium. The obtained high yield emphasizes the efficiency of potassium fertilizers (Patentkali, KaliumSulphate, Korn-Kali produced by KALI und SALZ GmbH) with some of the main field crops, in Romania (maize, potatoes, tomatoes, sugar beet and vine).

Key words: yield efficiency, potassium fertilizers, field experiments

Danyte V., Fotyma M. Concentration of potassium In plant sap as the indicator of potassium requirements, str. 310

Abstract

The most common plant tests are based on the total content of the nutrients in the plant tissue. Potassium differs from other macronutrients because appears almost exclusively in the tissue water (plant sap) and not in plant body. Therefore the concentration of K in tissue water might be better plant test than the content of potassium in plant dry matter. In the paper the results of investigations on different methods of potassium concentration measurement in cereals are presented. Potassium in samples of cereals collected in shooting stage was measured by three methods: in dry matter (and recalculated to potassium concentration in plant sap), in plant sap by spectroscope and in plant sap by portable ion meter. The strongest correlation occurs between potassium concentration in plant sap measured by spectroscope and potassium

concentration in plant sap measured by ion meter ($R^2=0.79$). Portable ion meter seems to be a very reliable instrument and can be used to measure potassium concentration in plant sap.

Key words: potassium in plant dry matter, potassium in tissue water, portable ion meter.

Fotyma E., Interaction of nitrogen and potassium fertilization of arable crops , str. 319

Abstract

In the paper the results of 2 long term experiments with nitrogen and potassium fertilization are presented. The withdrawal of potassium from fertilization in the last 3 years of the experiments did not result in significant yield decreases though there was a tendency to lower yields in the treatments without K on higher nitrogen rates. The content and uptake of potassium by crops considerably increased under the influence of nitrogen fertilization, while the influence of potassium fertilization was insignificant. Maize proved to be the crop not susceptible to potassium deficiencies.

Key words: nitrogen fertilization, potassium fertilization, interaction of potassium and nitrogen

Grzebisz W. Potassium fertilization of arable crops – the crop rotation oriented concept, str. 328

Abstract

Yields of main arable crops in Poland are much below potential as indicated by covarieties evaluation. Naturally poor soil fertility level combined with imbalanced nutrients application are the main factors limiting plant crops productivity. The main farmer's goals of plant crops fertilization with potassium are (i) to diminish year to year variability of harvested yields and (ii) to increase N use efficiency. The prerequisite for successful plant production is non-limiting supply of soil potassium to growing plants during stages of the highest biomass increase. At the field level the K balance sheet for the whole crop rotation is a base of its rational management. Amounts of the applied K needed to recover its losses due to harvest or/and leaching are in part the result of crop's by-product management. Potassium timing seems to be of secondary importance taking into account the main goals of K management. Natural growing conditions, mostly related to stress factors, can only modify time of potassium fertilizers application.

Key words: plant crops, potassium, crop rotation, management, fertilization

Jankowski K., Kolczatek R., Kisielinska B., Jodelka J., Ciepiela G. Influence of a meadow fertilization with vermicompost on the content of potassium in fodder, str.. 342

Abstract

A new biotechnology of the production of a high-grade organic fertilizer, vermicompost, - also known as biohumus or proposit humus, - has been applied in Poland for several years. According to many authors [Baran and other 1996, 1998; Patorczyk-Pytlik, 1998] vermicompost has a rich chemical composition. It is produced by the earthworm *Eisenia Fetida Sav.* Varied organic materials contain considerable quantities of alimentary components in general forms and forms accessible to plants i.e.- humus components. They also have a large sorption capacity and high degree basic cations. Applying vermicompost, we also introduce nitrogen and different macro- and microelements, which create favorable conditions for plant development and increase the yield of crops. The subject of the investigation was the application of an organic manure in the background of mineral fertilization (-NPK, + NPK) on the meadow in 1999-2001. The results showed that the applied organic fertilization had a highly significant influence on the content of potassium in the fodder harvested each year. From a nutritional point of view, the potassium content was high enough to cover animal, needs for this element.

Key words: fertilization, biohumus, organic manure, potassium, fodder, vermicompost

Borawska-Jarmulowicz B. The content of potassium, calcium and magnesium in regrowth of pasture mixtures sward, str.349

Abstract

The studies were carried out in 1990-1992 in central Poland on a natural moderately dry meadow site on the black-earth soil with low potassium content. The objects were three pasture mixtures, early, mid-early and late. The aim of the study was to evaluate the changes in botanical composition and potassium, calcium and magnesium content in sward of pasture mixtures in the following regrowths. Five simulated grazing have been applied – first at height 15-20cm, the following at 20-25cm. It was found that content of these nutrients in investigated mixtures varied significantly depending on the year of management and regrowth. Botanical composition and meteorological conditions affected it.

Key words: pasture mixtures, potassium, calcium, magnesium, regrowth

Kalembasa D., Malinowska E., Jaremko D., Jezowski S. The content of potassium in different clones of *Miscanthus* upon the clones and mineral fertilization, str. 359

Abstract

In biomass of five *Miscanthus* clones (2 diploid and 3 triploid) the total content of potassium by ICP-AES method was determined. The highest content of potassium 5,09 g.kg⁻¹ of D.M. was stated in the aboveground part of diploid clone no.19 and the lowest 2,17 g.kg⁻¹ of D.M. also for diploid one no. 1. Rhizoms contained higher amount of potassium than leaves, roots or stems. The mineral fertilization (NPK) increased the content of potassium in above ground part of triploid clone no.53 and diploid clone no.19 and decreased in biomass of following clones no. 1 diploid and for triploids no.63 and POL.

Key word: biomass, *Miscanthus grasses*, potassium

Kastori R., Cuvardic M. Long-term field trials with potassium fertilizers in Serbia str. 365

Abstract

The aim of this paper was to consider (review) the results of the long-term field trials with potassium fertilization on different soil types in Serbia. Studies of the effect of different doses of K-fertilizers on yield performance of the major field crops grown on different soil types have shown moderate effects of K. Regardless of the soil types, with exception of sugar beet, doses above 60 kg ha⁻¹ of K₂O did not affect positively the yield performance of the field crops. The main reason for only a moderate effect of K-fertilization is the fact that most soil types in Serbia are medium-to-well supplied with available K. The results of the field trials show considerable amount of available K even when K fertilization has been omitted for many years.

Key words: AL extractable K, yield, crop quality, K utilization.

Kovacevic V., Seput M., Simic B.– Maize response to fertilization with KCl under conditions of Eastern Croatia – a review, str.372

Abstract

The application of increased rates of potassium chloride (KCl) was tested in the field experiments conducted in the period from 1984-2003. In general, considerable influences on maize grain yields, stalk lodging (SL) resistance and composition of leaves were found. For

example, rates up to 2670 kg K₂O/ha were applied in the Mikanovci trial where maize yields (3-year means) increased from 1.93 (control) to 7.64 t/ha. Simultaneously, nutritional (ear-leaf composition) and SL status of maize were improved. Furthermore, 1400 kg K₂O/ha was applied in the second trial which resulted in maize yield increase by 14% (mean of five hybrids), whereas SL decreased from 42% (control) to 18%. The OsSK444 and Florencia hybrids were resistant, while OsSK458, OsSK552 and Bc5982 were susceptible to SL on the K-deficient soil.

Key words: fertilization with KCl, maize, nutritional status of plants

Lošák T., Richter R., Hlubek J., Popp T., Antoniewicz J., Ducsay L. Potassium and its forms in fertilization of poppy (*Papaver somniferum* L.), str. 379

Abstract

In a pot experiment with poppy, variety Opál, we explored the effect of two doses of potassium (0.845 and 1.69 g K₂O per pot) in the form of potassium sulphate (K₂SO₄) and potassium salt (KCl) on yields and the content of morphine in poppy straw. Compared to the control variant, seeds showed a statistically highly significant increase when the two doses of potassium in the form of K₂SO₄ were applied, i.e. by 18.0 – 25.1 %, and with only a higher dose of KCl by 11.9%. The concentration of morphine in poppy straw (empty capsule + 15 cm of stem) increased statistically significantly, i.e. by 10.9%, only in interaction with a higher level of K in K₂SO₄, compared to the control variant not fertilised with potassium.

Key words: poppy, fertilisation, potassium, morphine

Mastalerczuk G., Stypiński P. The influence of the management intensity and soil water conditions on the content, uptake and distribution of potassium in grass sward, str. 384

Abstract

The aim of study was to estimate the K uptake and content in different grass organs due to the intensity of management and soil moisture. Two field trials have been established in moderate wet and moderate dry site. On the both sites three levels of management intensity have been applied: intensive, medium and extensive. Potassium fertilizers were applied in total amount 100 kg K ha⁻¹ in two equal doses in spring and after the first regrowth. Potassium content in the soil and plants has been measured by spectroscopy method (ASA). It has been proved that the highest potassium content was in the leave blades and stems, the low content was found in

the roots. Content of potassium in leaves was higher in the dry condition than in wet site. The K intake by plants was higher than the dose of potassium applied in fertilisation, particularly on the treatment with higher nitrogen fertilisation and cutting frequency. Comparatively high potassium accumulation has been found in roots, otherwise 27 % in comparison to total potassium accumulation and intake. Potassium accumulation in leaves and stems was higher on the intensive management what is correlated with higher yield obtained in that condition.

Key words: content of potassium, intensity of management, permanent meadow, uptake of potassium

Ragályi P., Kádár I. Long term effects of mineral fertilization on the yield and element content of grass, str. 395

Abstract

The main effects of different NxK and PxK supply levels were examined on the yield and element content of an established all-grass sward in a 28-30 years old field trial put on a calcareous chernozem loamy soil. The 1st year results showed that the 130-150 mg kg⁻¹soil AL-P₂O₅ and AL-K₂O „moderate” supply levels in plow layer basically satisfied the PK demand of grasses. First of all the N-supply restricted the growth. The K-fertilization had marked effect on the hay mineral element content: stimulated the K, and N uptake while the Ca, Mg and Na uptake was depressed. On the highest PK supply levels the hay Mo content dropped an order of magnitude thus PK overweight can induce Mo-deficiency on this soil. This phenomena can only be revealed by diagnostic plant analysis.

Key words: field trial, NxK and PxK nutrition, grass yield, element uptake

Stępień W., Mercik S., Sosulski T. The influence of potassium form and methods of application on the yield and quality of selected crops, str. 401

Abstract

The effects of potassium chloride, potassium sulfate and kalimagnesia fertilization applied on 5-crop rotation system are presented in this paper. The data were collected between 1985 and 2004 in long-term fertilizer experiments carried out at the Experimental Station of Warsaw Agricultural University. Potassium chloride treatment was applied on potatoes and wheat either every year or twice in rotation. The effect of kalimegnesia on barley yields was significantly better comparing with potassium chloride. The clover yields obtained under

potassium sulfate tended to be higher than those obtained under potassium chloride. The mode/ frequency of potassium chloride application (every year vs. twice in rotation) did not have significant effect on the yields. None of the studied ways of potassium fertilization did worsen the plant quality evaluated by K: Ca+Mg ratio.

Key words: mass fertilization with potassium, 5 course crop rotation, potassium fertilizers

Symanowicz B., Kalembasa S. – The dynamic of potassium uptake by goat's rue (*GALEGA ORIENTALIS* LAM.) in the third and seventh years of cultivation ., str. 409

Abstract

The content of potassium in dry mass of goat's rue (*Galega orientalis* Lam.) in the third and seventh year of cultivation in total plant, leaves and stems as well as in the different development stages is presented in this paper. The mean content of potassium in the dry mass of whole plant reached 14,93 g · kg⁻¹. The higher content of potassium in the biomass of goat's rue was determinate in the third than seventh year of cultivation: 16,29 g · kg⁻¹ i 13,58 g · kg⁻¹ respectively, as well as in the budding stages (22,68 g · kg⁻¹).

Key words: potassium, goat's rue

Szulc W., Rutkowska B., Labetowicz. The effect of potassium on plant yields In dependence on liming and farmyard manure application ,str. 415

Abstract

The effect of potassium on yield of potatoes and barley in dependence on liming and farmyard manure application in long – term experiment conducted on sandy soil was determined. The yields of potatoes increased from 18% to 43% and those of barley from 20% to 33% in relation to objects without potassium. The highest value of net efficiency of potassium fertilization was observed in condition of mineral fertilization with liming and the lowest in condition of mineral fertilization.

Key words: potassium, potassium fertilization, long-term experiments

Vasilev I., Nikolova M. Influence of different potassium forms on the field and quality of potatoes, str. 423

Abstract

The effect of various forms of potassium fertilizers on the yield and quality of potatoes was investigated. A field experiment with potatoes was carried out in one of the main potato growing regions in the country. The effect of potassium was tested with potassium chloride, potassium sulphate and potassium magnesium sulphate. The results show a positive potassium effect on yield and quality parameters. The best results were obtained using potassium magnesium sulphate – 19% tubers yield increase, 32% starch yield increase. In spite of the higher price potassium magnesium sulphate gave one highest profit more than two times higher in compare to potassium chloride and about 70% in compare to potassium sulphate.

Key words: potato, potassium sulphate, potassium chloride, tubers quality

Gastol M., The content of potassium in different organs of apple tree v. Jonica , str. 427

Abstract

The paper presents the results of chemical analyses of different organs of 'Jonica' apple trees. The trees were grafted on P60 rootstock. In the years 1996-1998 samples of fruits, leaves, wood, bark and roots were taken. After washing the samples were dried, ground, mineralized and analysed using atomic absorption spectrophotometry to assess the content of potassium. The lowest concentration of potassium was noted in the wood of investigated trees (0.17 % d.w). A fairly higher concentration of K was investigated in bark (0.48 % d.w.) and roots (0.47 % d.w.) followed by fruits (0.69 % d.w.). The highest concentration was found in leaves (1.24 % d.w.). There was no changes in bark, wood and roots potassium content between different seasons, whereas some fluctuations in fruit and leaves K concentration were recorded.

Key words: *Malus domestica*, potassium, mineral composition

Jadczyk E. Potassium nutrition of horticulture crops in the light of scientific research, str. 432

Abstract.

In the paper the problem of potassium nutrition of horticultural plants is presented. The K nutritional status of fruit trees is dependent on soil resources in K and soil management. Very significant influence on mineral element content in plant tissue has the specific properties of fruit trees: depth of root system and long term of roots activity; long-term character of trees; genetics properties of rootstock and cultivar. The modifier factor of K nutritional status is also weather conditions in vegetative season and fertilization.

Key words. K nutritional status, sour cherry, apple trees, rootstock, fertilisation.

Nurzyński J. Effect of potassium fertilization (KCl, K₂SO₄, KNO₃) on the yield and chemical composition of substrate and leaves of greenhouse vegetables, str. 448

Abstract

The experiments were carried out on tomato, cucumber, sweet pepper, lettuce in peat or rockwool. The effect of potassium fertilizers as KCl, K₂SO₄, KNO₃ on the yields was investigated. Moreover, the content of dry weight, K, N-NO₃, S-SO₄, Cl and Mo in leaf was determined. KCl had no negative effect on the yields of vegetable and on the EC in the substrate. Plants fertilized with potassium sulphate contained more nitrates and less molybdenum than plants fertilized with KCl. Photosynthesis Intensity of plants supplemented with K₂SO₄ was significantly higher than in KCl and was not associated with leaf stomata conductivity. The leaf transpiration increased more under the influence of KCl than K₂SO₄.

Keywords: potassium nutrition, greenhouse vegetable, N-NO₃, Cl, Mo.

Skrzynski I., Gastol M. The effect of rootstocks on the potassium content in organs of apple tree v. Jonagold, str. 457

Abstract

The effect of polish rootstocks: P 2, P 14, P 22, P 60 were studied in comparison to standard ones M.9 i M.26. The significant effect of rootstocks on the potassium content in roots, wood and fruits of 'Jonagold' apple trees of full production capacity has been demonstrated. Trees on rootstock P 60, among all studied rootstocks were having the highest K content in roots and the lowest in wood and in fruits. Application of rootstocks M.9 i P 14 cause an increase of

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K in fruits; those treatments were having the highest (respectively 37.7 and 35.4) K/Ca ratio. The best potassium o calcium ratio was noted in fruit from trees on P 60 i P 22 rootstocks.

Key words: apple, rootstock, mineral content, potassium

Domagala-Swiatkiewicz I., Effect of the soil properties on the potassium nutrient status of the apple tree, str. 467

Abstract

The effect of physico-chemical properties of the soil on chemical composition of apple tree leaves and the grade of potassium nourishment of plants was investigated in six apple tree orchards localized on the heavy soils. Analysis of plant material showed negative correlation between K content in the leaves and the levels of Mg and Ca. Potassium content , determined in the leafy tissue significantly depended on K extracted fromthe soil either with 0.03 M CH₃COOH or with lactate as well as ween K⁺ concentration in the index parts of apple tree and the exchangable Mg and Ca of the soil was found. The results of K⁺, Mg⁺², and Ca⁺² detection in the soil sorption complex can be useful in explanation of the soil tests and in establishment of the nutritive needs of plants.

Key words : Apples, soil properties, potassium, plant nutrient status