Journal of International Scientific Publications:
Materials, Methods & Technologies, Volume 5, Part 1
ISSN 1313-2539, Published at: http://www.science-journals.eu

DIFFERENT NUTRIENT SUPPLY ON SWEET CORN

Ferenc Orosz
Department of Horticulture, Sapientia University of Tg. Mures,
540485 Tîrgu Mureş, Şoseaua Sighişoarei 1C, Romania.
E-mail: ferenc.orosz@uni-corvinus.hu

Abstract

In our trial, we studied, if the double increasing of nutrient elements (NPK) dosis more than recomanded by nutrient balance approach system, we can improve yield's quantity and quality of sweet corn. The treatment without fertilization – based on symptoms, because of nitrogen deficiency – produced weak results. The plants from fertilized treatments didn't produce any deficiency or overdose symptoms. Compared to control treatment, the application of higher fertilizer doses didn't influence significantly crop's development, so we consider adequate to apply, in similar growing circumstances the fertilizer dosis included into control treatment.

Key words: *nutrient balance approach system, double N-, double P-, double K- dosis.*

INTRODUCTION

The sweet corn is the vegetable grown on the largest acreage in Hungary. In 2003 the growing area was 38,000 hectares according to the Hungarian Interprofessional Organization for Fruit and Vegetables and Product Board. After 2003 however a sudden and sharp decline took place and this way in 2005 production was carried out only on 24,000 hectares, while in 2006 over 30,000 hectares, again.

Sweet corn production destinated for industrial processing is mechanised. In Hungary on 95% of producing area are cultivated the so called „normal sweet" varieties, which even in favourable meteorological conditions keep their quality 3-4 days untill harvesting. Condition of eficient mechanical harvesting is treaching maturity in the same time.

Sweet corn need for 1 tone yield to produce 9 kg N, 3,6 kg P_2O_5 and 10,2 kg K_2O. in soil with medium NPK content sweet corn need according to nutrient balance approach system 216 kg N, 92 kg P_2O_5 és 229 kg K_2O (Terbe and Csathó, 2004). The nutrient supply is perhaps the most important component of the cropping system in plant production. Berzsenyi and Györffy (1995), after the analysis and evaluation of a long term trial over 35 years, concluded the fertilization 31% and the genotype to be the most important yield increasing factors, followed by the optimal plant density, attentive plant care and tillage. Nagy (1995) ranked the cropping system components according to the impact on corn yields as follows: fertilization 48%, irrigation 28%, tillage 18% and plant density 6%. A continuous fertilization influences not only the nutrient processes of the current year but will modify the soil nutrient processes during the subsequent years which is to be considered in determining fertilizer rates (Lásztity and Csathó, 1994). Among the three main nutrients, it is the nitrogen that is considered to have the biggest importance, as it has a decisive influence on yield, but in the event that a dose of over 60-120 kg/ha is applied, depending on soil type, a harmful accumulation of NO_3 may occur (Sárvári, 1995). The movement of P and K fertilizers differs from that of N fertilizers. According to Szirtes and Gál (1980) P and K fertilizers should be tilled into the soil to a depth of 15 to 25 cm.

ISSN 1313-2539, Published at: http://www.science-journals.eu

MATERIAL AND METHODS

The experiments were set up in 2007 on an area equipped for irrigation at the Experimental Farm of the Faculty of Horticulture of the Corvinus University of Budapest.

The soil sample collected from the site of the trial prior to the direct seeding had a pH of 8.03, an organic material content of 1.31%, a plasticity index according to Arany <30, an ammonium lactate soluble P_2O_5 content of 293 mg/kg, an ammonium-lactate soluble K_2O content of 205 mg/kg and $CaCO_3$ <1%.

The pH of soil was considered calcarous. The nutrient content of soil in nitrogen was low, in phosphorus very good and in potash good.

For the basic material of the experiment I choose a normal sweet corn variety of short growing period (Spirit) which is broadly used, reliable and sufficiently known among Hungarian growers. Under our climatic conditions the most important requirement for early varieties from the point of production to have, besides a short growing period, as high a tolerance as possible to ground frosts in late spring and to the great fluctuations in temperature occurring in this period.

The variety Spirit is a very early one, has a growing period of 85 days, its grains are yellow in colour. Average height is 159 cm, ear height is 37 cm, average ear length 19.6 cm as measured in the variety comparison trials carried out by the Central Agricultural Office (earlier National Institute for Agricultural Quality Control), average ear weight 245 g. The variety was granted official recognitions in 1988 and has been the dominant variety of the early ripening category till now.

The variety is used as a reference variety in the variety comparison trials of the Central Agricultural Office.

The method of propagation was direct seeding, at a depth of 3 cm on Apr 26th. The cornstand was formed to have a plant spacing of 75 by 22 cm (60,607 plants per hectare) in accordance with the recommendations of the owner of the variety. Each treatment had an area of 6x7 m (8 parallel rows and 30 seeds sown in each row). The edge was the outer 2 rows, respectively on both sides, of the 8 rows of the plot. 4 parallel replications were applied.

The treatments were applied by way of fertilizers. No farmyard manure was applied. A combination of ammonium nitrate (34%), superphosphate (19.5%) and potash (60%) was used for the treatments and approximately half of the N rate and the total of the P and K rates were applied as starter fertilization on Apr 20th, while the remaining part of the N rate was applied in two parts as top dressing: at the 6 to 7 leaf stage and at tasselling. The treatment 3 was an exception where the 2N fertilization, besides the aforementioned dates, was applied on two further occasions. The area received one herbicide application and one mechanical weed control treatment.

The following treatments (active ingredients) were applied during the experiment besides the untreated control (no fertilizer application):

K1 = untreated control N_0, P_0, K_0.

K2 = $N_{222.5}$, $P_{22.5}$, $K_{222,5}$.

K3 = N_{445}, $P_{22}.5$, $K_{222,5}$

K4 = $N_{222.5}$, P_{45}, $K_{222,5}$

K5 = N_{445}, $P_{22.5}$, K_{445}

ISSN 1313-2539, Published at: http://www.science-journals.eu

The harvest was carried out in two passes. In the course of the harvest the ears were picked together with their husks and then 20 ears were selected from each treatment in a random fashion and the following measurements were carried out:

unhusked ear weight (grams)

husked ear weight (grams)

total ear lenght (cm)

lenght of seeds

seeds/ rows

ear diameter, as well as determining possible parameters through calculation from these data: average yield per unit area and net ear weight ratio.

The statistical analysis of the results was carried out by using the programme RopStat 1.1. When the standard deviations were identical the mean values were compared by pairs using the *Tukey-Kramer* test, while in the case of the non identical standard deviations the means were compared using the *Games-Howell* test (Vargha, 2007).

RESULTS AND DISCUSSIONS

The first measured parameter after harvesting was ear weight bruttó (unhusked), which results are represented on figure 1.

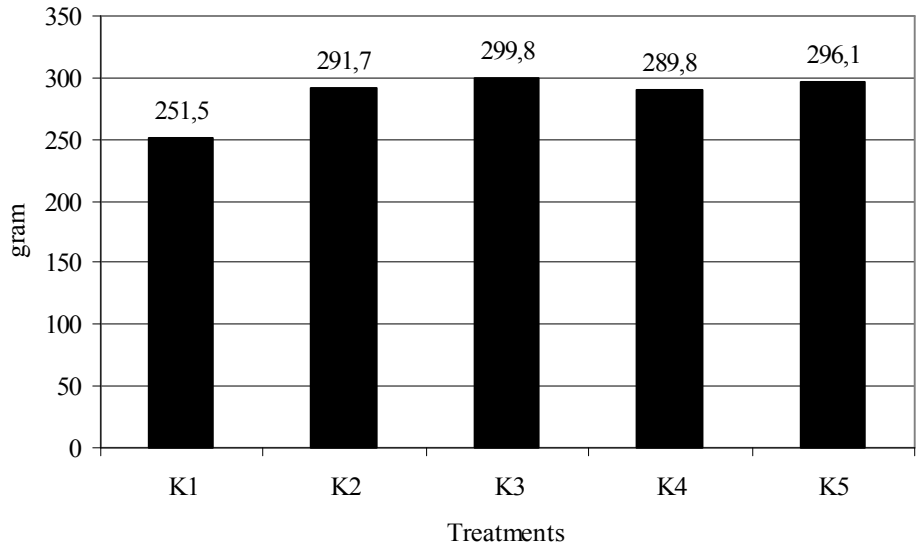


Fig. 1. Unhusked ear weight (g).

Based on figure 1. we conclude, that all treatments had significantly higher results for cob weight bruttó than K1 (nilcontrol) treatment. The highest results was produced by treatment K3.

After husk removal, we measured the cob weight netto, represented by figure 2.

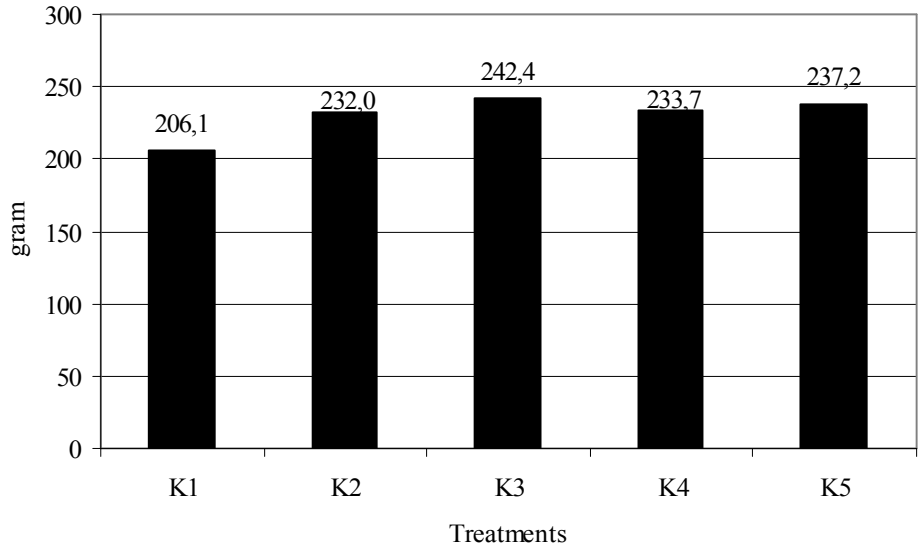


Fig. 2. Husked ear weight (g).

By this measured parameter we found the same tendences as by unhusked cob weight, so treatment *K6* results was the highest. In comparison to K2 and K4 the difference were significantly at ($p<0,1$ level). Compared to K1 all treatment's cob weight neto results were significantly at ($p<0,01$ level) higher.

After total ear lenght measurment (figure 3.), we observed ears of K3 treatment, has the greatest value (on average), but K2, K4 and K5 treatments followed they closer. In comparison with nilcontrol all treatments produced better results.

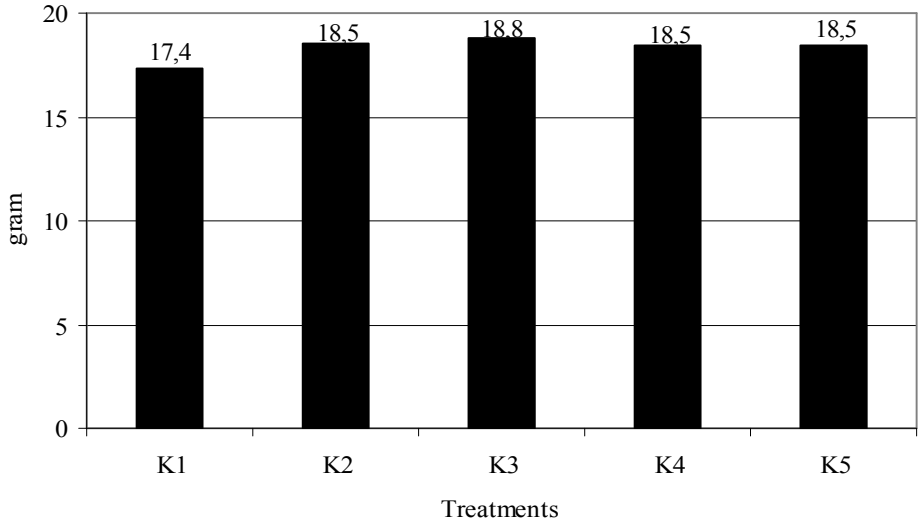


Fig. 3. Total ear length (cm).

ISSN 1313-2539, Published at: http://www.science-journals.eu

In case of another important measured parameter, length of seeds (figure 4.), the best results was produced by K3 treatment. The nilcontrol (K1) was overtaken by every treatment. Between K3. and K5. treatments we found significant difference at ($p<0,01$ level). confirmed by statistics. Between treatments K3 and K4, the difference was significantly at ($p<0,05$ level).

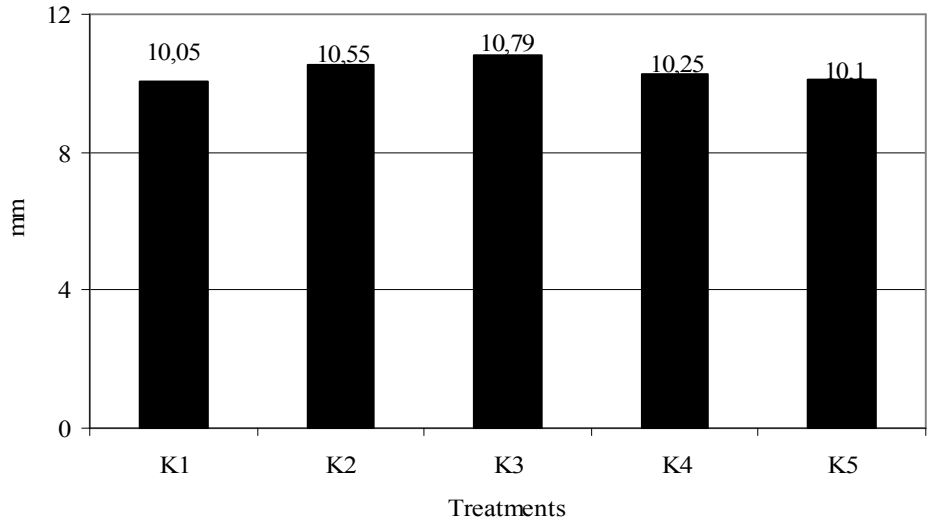


Fig. 4. Length of seeds (mm).

In case of seeds/row (figure 5.), we counted, how many developed seeds are on average in a row. In case of K5. treatment we found the highest number of seeds. Among the other treatments we didn't find significant difference, but in comparison with nullkontroll all treatments were significant higher.

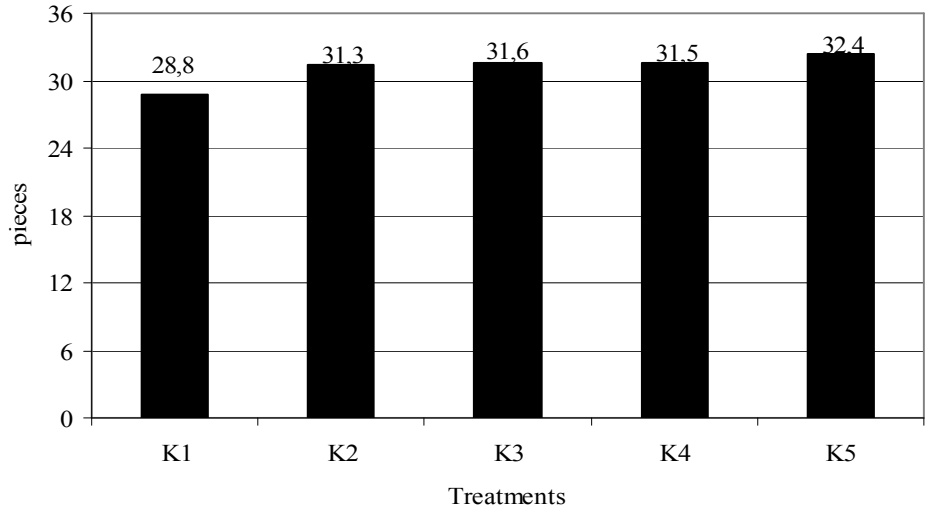


Fig. 5. Seeds/rows (pieces).

Measuring ear diameter (figure 6.) the est result was produced by K3. treatment. It was significant ($p<0,05$ level) higher, than nilcontrol (K1). In case of K4 we measured also good result but the difference was not significantly.

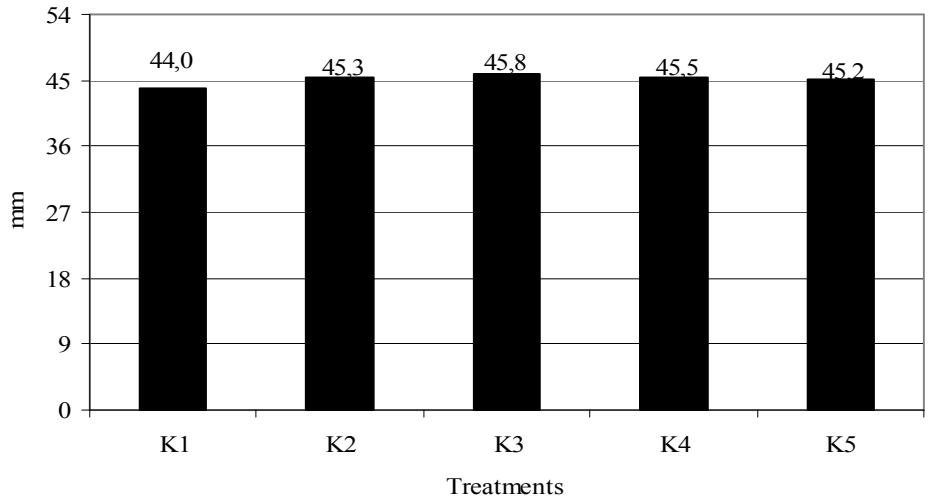


Fig. 6. Ear diameter (mm).

The best results in yield on average (figure 7.), we calculated based on production in kg unhusked cobs harvested from average of 4 replications (42 m^2), we found by K3. and K2. treatments, but the statistics didn't find significant differences among the treatments. At the same time in comparison to nullkontroll all treatments produced better results. Interesant, the difference among K4 and K3 is over 2000 kg, but the statistics didn't find it significant. Aveage yield of K1 treatment was significantly lower compared to other treatments ($p<0,01$ level).

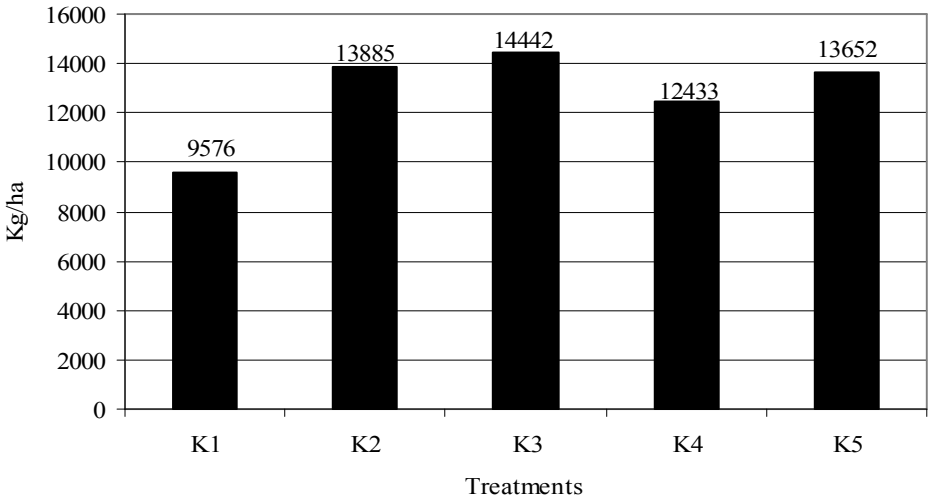


Fig. 7. Yield on average (kg/ha).

CONCLUSIONS

After 2007. year experiment we made the following conclusions:

In case of **K1** (**nilcontrol**) treatment we couldn't made, without nutrient supply, ecomonical production, as result of the low yield quantity. In most of measured and calculated parameters it produced the significantlylower results.

The **K2** treatment (N-P-K), we didn't observe extremly results, all measured parameters had good and equilibrate results.

The **K3** treatment (2N-P-K) produced the highest results (excepted number of seeds per rows) than other treatments.

The **K4** treatment (N-2P-K) results, we could compare to K2 treatments results it wasn't either the best or the worst by any measured parameters. It has relatively good results by total ear lenght, seeds/rows and ear diameter, but the average yield result, excepted K1, was worst than other treatment's.

In case of **K5 treatment** (N-P-2K), we observed the highest values rate by seeds/rows. At the same time we observed good results in unhusked- and husked ear weight, total ear lenght and ear diameter.

REFERENCES

1. Berzsenyi Z, Györffy B. Különböző növénytermesztési tényezúk hatása a kukorica termésére és terméstabilitására. Növénytermelés 1995; 44: 507-517.
2. Lásztity B, Csathó P. A tartós NPK műtrágyázás hatásának vizsgálata búza-kukorica dikultúrában. Növénytermelés 1994, 43: 157-167.
3. Sárvári M. A kukorica hibridek termőképessége és trágyareakciója réti talajon. Növénytermelés, 44. 179-191.
4. Szirtes V., Gál J-né (1980) A kukoricatermesztés fontosabb paraméterei csernozjom talajon II. Műtrágyázási mód-igény, különös tekintettel a PK-készlet trágyázási lehetőségekre. Növénytermelés 1995; 29: 421-428.
5. Terbe I., Csathó P. (eds.) Környezetkímélő tápanyag-gazdálkodás a szabadföldi zöldségtermesztésben. Budapesti Corvinus Egyetem Kertészettudományi kar, Zöldség- és Gombatermesztési Tanszék – MTA Talajtani és Agrokémiai Kutatóintézet. Budapest, 2004.
6. Vargha, A. Matematikai statisztika pszichológiai, nyelvészeti és biológiai alkalmazásokkal. Pólya Kiadó. Budapest, 2007.