Jurnal Ilmu Pertanian Indonesia (JIPI), Januari 2025
(Indonesian Journal of Agricultural Sciences)
ISSN 0853-4217 EISSN 2443-3462

Vol. 30 (1): 187–194
http://journal.ipb.ac.id/index.php/JIPI1
DOI: 10.18343/jipi.30.1.187

OPEN ACCESS Check for updates

Combination Effect of NK and P Fertilizers on Soil Available-K, K Absorption, and Sweet Corn Productivity in Inceptisols

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(Received April 2024/Accepted December 2024)

ABSTRACT

One factor affecting sweet corn's (*Zea mays saccharata* Sturt.) productivity refers to soil fertility and proper fertilization. This study aimed to determine the optimal combination of NK and P fertilizer doses to enhance the growth and yield of corn grown on Inceptisols. This research was conducted at the Soil Chemistry and Plant Nutrition Experimental Field, Faculty of Agriculture, Universitas Padjadjaran. The Randomized Block Design consisted of 10 treatments with three replicates each. The treatments included: A, control; B, standard NPK; C, ¼ dose NK + 1 P + ½ N; D, ½ dose NK + 1 P + ½ N; E, ¾ dose NK + 1 P + ½ N; F, 1 dose NK + 1 P + ½ N; G, 1¼ dose NK + 1 P; H, 1 dose NK; I, ½ dose NK + ½ single N,P,K; and J, ¾ dose NK + ¼ single N,P,K. The results showed that the combination of NK and P fertilizers significantly affected the growth and yield of sweet corn. The treatment with ¾ NK + 1 P + ½ N had a notable impact on cob weight (0.33 kg/cob), cob diameter (5.05 cm), and cob length (21.2 cm). This treatment also increased K absorption to 34.49, available soil K to 2.45 cmol kg^{-1}, and the sweetness level of corn to 13.56%. This study provides new recommendations for corn fertilization to improve the growth and yield on Inceptisols.

Keywords: optimal fertilizer dosage, corn growth, corn productivity, nutrient uptake

INTRODUCTION

Sweet corn is a popular commodity in Indonesia. This agricultural commodity is popular in the community because of its high nutritional content and economic value. According to the Central Statistics Agency (2018), the achievement of sweet corn production in 2018 was 30.1 million tons, with a land area of 5.7 million ha, while the production target that has been determined is approximately 33.15 million tons. The corn harvest area in 2017–2018 slowed, with an average growth of approximately 3.64%. The need for sweet corn plants can be fulfilled by increasing productivity and expanding the planting area on land, which has the potential to be used as agricultural land (Sahuri 2017). The cultivation is generally carried out on dry land, one of which is Inceptisol soil. Jatinangor inceptisols have soil fertility levels that vary from low to high (Sofyan 2023).

Increasing the productivity of sweet corn in Inceptisol soil can be achieved by applying balanced fertilization, considering the application of inorganic fertilizers that are suitable for plant needs (Mulyati *et al.* 2021). Large quantities of nutrients required by corn plants include nitrogen (N), phosphorus (P), and potassium (K). One fertilizer that can be used for the growth of corn plants is NK fertilizer (Xiong *et al.* 2017). NK fertilizer is a fertilizer that is still not widely known to the Indonesian people, especially farmers. Technically, the application of compound fertilizers can save more labor and time needed to fertilize, but according to Supriyadi *et al.* (2017), the application of NK fertilizers that only contain the elements N and K still needs to be added to P nutrients because the nutrients N, P, and K are macronutrients that are very important for plants.

The addition of compounds and single fertilizers can increase the absorption of K. According to Panjaitan (2018), the application of NPK 15:15:15 fertilizer has a significant effect on the growth and production of sweet corn at plant heights of 2, 4, and 6 WAP (weeks after planting), crop production, and per-plot production at doses of 10 g/plot or 100 kg/ha. Fi'liyah *et al.* (2016) reported that the application of K fertilizer in the form of KCl at a dose of 150 kg/ha could increase the K absorption 23.38 higher than that without KCl fertilizer. Pusparini *et al.* (2018) revealed that the use of NPK fertilizer with a dose of 300 kg/ha is the optimal dose to increase the growth and yield of hybrid corn (8.92

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tons/ha). This study aimed to obtain a combination of NK and P fertilizer doses that could increase the growth and yield of corn on Inceptisols.

METHODS

Time and Site of Research

This research was carried out from October 2019 to January 2020 at the Soil Chemistry and Plant Nutrition Experimental Field, Department of Soil Science and Land Resources, Faculty of Agriculture, Padjadjaran University, Jatinangor, Sumedang Regency, West Java, at an altitude of 778 m above sea level. Soil analysis was performed at the same institution's Laboratory of Soil Chemistry and Plant Nutrition.

Materials and Equipment

The materials used were corn seeds of the Talenta variety, planting media in the form of Inceptisol soil, urea fertilizer (46% N), SP36 (36% P_2O_5), KCl (50% K_2O), NK fertilizer, furadan, distilled water, and chemicals used to analyze the available-K value and K-uptake in the sweet corn plants tested. The analytical equipment were scales, calipers, Brix refractometers, atomic absorption spectrophotometry.

Research Design

The study used a Group Random Design consisting of 10 treatments (Table 1). The recommended fertilizer dosage was Urea 300 kg/ha, SP-36 150 kg/ha, and KCl 50 kg/ha, while the treatment dose used was NK fertilizer 350 kg/ha and P fertilizer 150 kg/ha. Each treatment was repeated three times so that there were 30 experimental plots with a size of 2.4 m x 2 m, and there were 24 planting holes with a planting distance of 75 cm × 25 cm. Urea fertilization was carried out three times (7, 21, and 35 days after planting, DAP), whereas SP-36 and KCl fertilizers were applied at the time of planting.

The observed vegetative growth components were plant height, leaf number, stalk diameter, and canopy diameter. The parameters analyzed were K-available soil using the NH_4OAc method, pH 7.0, and K-uptake by the wet ashing method using $HClO_4$ and HNO_3. The components of the measured results were the weight of the cob with the husk, weight of the cob without the cob, diameter and length of the cob, and sugar content (brix). The observed corn plant growth parameters were plant height, canopy diameter, stalk diameter, and number of leaves. The plants were observed every two weeks starting from 14 to 56 DAP (maximum vegetative). Plant height was measured from the base at ground level to the highest vertical formation of the leaf tip.

Testing of differences in the average effect of treatment was carried out using the *F*-test at a level of 5%. If the treatment had a significant effect on the results, further tests were performed using the Duncan double distance test at a significant level of 5% (Gomez and Gomez 2007).

RESULTS AND DISCUSSION

Initial Soil Analysis

Inceptisols have varying soil fertility levels, ranging from low to high. The results of the analysis of Inceptisol soil in the Unpad Jatinangor experimental field used in the study showed that the soil contained 3.94% C-organic with a high category. The total N was 0.34% in the medium category, the potential P was 47.77 ppm P in the high category, the K-potential was 26.21 mg/100 g in the medium category, and the resulting C/N ratio had a medium category with a value of 11. Echangeable-K was 0.81 cmol kg^{-1} in the medium category, echangeable-Na 0.61 cmol kg^{-1} in the low category, exchangeable-Ca 13.03 cmol kg^{-1} in the medium category, and exchangeable-Mg 0.94 cmol kg^{-1} in the low category. This soil has a dusty clay texture with a sand content of 22%, dust of 55%, and clay of 23%, as well as a pH of H_2O 7.88 and pH KCl 5.97.

Table 1 Treatments used in the study

Treatment	Remark
A	Control
B	Standard N,P,K
C	¼ Dose NK + 1 P + ½ N
D	½ Dose NK + 1 P + ½ N
E	¾ Dose NK + 1 P + ½ N
F	1 Dose NK + 1 P + ½ N
G	1 ¼ Dose NK + 1 P
H	1 Dose NK
I	½ Dose NK + ½ single N,P,K
J	¾ Dose NK+ ¼ single N,P,K

Based on the description of the Inceptisol analysis above, the soil was in the moderate soil fertility level (Staff of the Soil Research Center 1983).

Corn Plant Growth

The height of sweet corn plants showed a noticeable increase from 14 to 56 DAP (Figure 1). The treatment that had the highest average plant height was in treatment E, with a plant height of 171.42 cm at 56 DAP, and the lowest corn plant height was in treatment A, with a plant height of 133.18 cm. Furthermore, treatment E was also better compared to the results of the recommended dose (treatment B). Kriswantoro *et al.* (2016) reported that the addition of inorganic fertilizers can affect the growth of sweet corn plants. The application of potassium to corn plants at optimal doses can increase plant height and the number of leaves of the plants. The increase in plant height is also related to the diameter of the crop canopy.

The wide canopy of the plants increased the shaded area. Figure 2 demonstrates the average diameter of sweet corn canopies in the various treatments. The average canopy diameter increased significantly at the age of 14-56 DAP in all treatments. Treatment A (control without inorganic fertilizer treatment) had the narrowest canopy diameter compared to all other treatments. Treatment E was the best treatment for increasing the canopy, even better than the recommended dose. The wider the leaf area produced by the plant, the wider the sunlight absorption area; thus, the photosynthesis process will be more optimal.

The third parameter is the diameter of the stalk (Figure 3). The treatment that had the smallest stalk diameter, namely in treatment A, without the application of inorganic fertilizer, had a width of 2.4 cm at 56 DAP. This is because, in treatment A, the nutrients needed are not met because plants rely only on nutrients in the soil. The existence of an adequate supply of potassium will help corn plants form sturdy and large stalks. According to Utomo (2015), potassium can increase the synthesis and translocation of carbohydrates, thereby increasing the thickness of the cell wall and strength of the stalk. In addition, potassium is also found in plants as a K^+ cation, which plays an important role in respiration and photosynthesis.

Another observed parameter was the number of leaves (Figure 4). The leaves are the main organs where

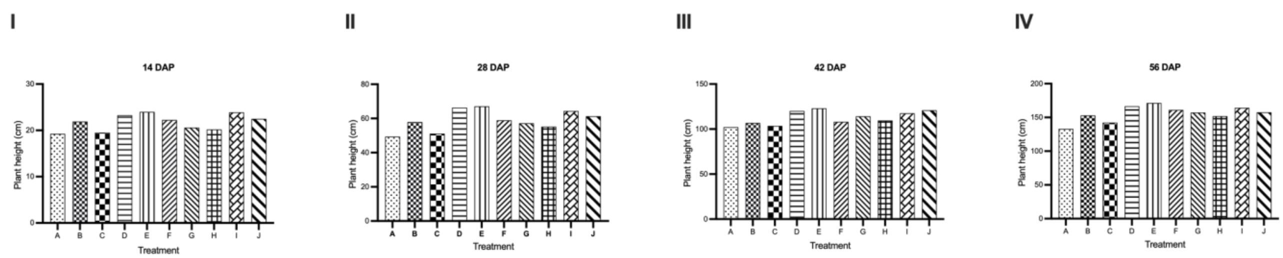

Figure 1 Average height of sweet corn plants of various treatments at the age of 14, 28, 42, and 56 DAP

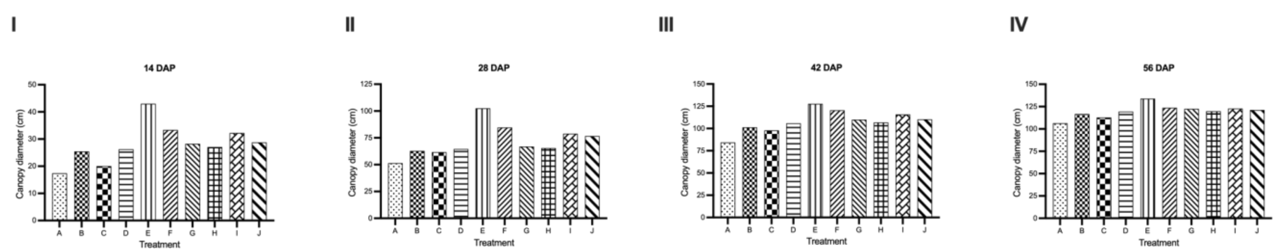

Figure 2 The average canopy diameter of sweet corn was treated at the age of 14, 28, 42, and 56 DAP.

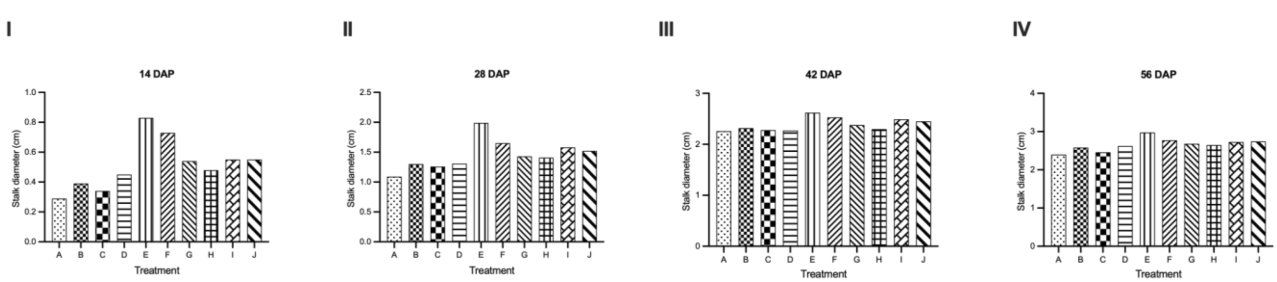

Figure 3 Average stalk diameter of sweet corn of various treatments at the age of 14, 28, 42, and 56 DAP.

photosynthesis occurs. The optimal number of leaves allows for a more even distribution of light between leaves. The number of corn leaves at the age 14–42 DAP did not show any significant differences between all treatments. This is because corn plants are still in the arly stages of growth, and leaf growth of the plant is dominated by the growth characteristics of the leaves of the corn plant itself (Solihin *et al.* 2019). Based on the observations, the the leaf number tended to increase in the final vegetative phase. Nitrogen (N) is the main nutrient for overall plant growth and is indispensable for the formation of vegetative parts of plants, such as leaves, stalks, and roots. Elemental N plays a role in stimulating the growth of stalks and leaves.

Available-K in Soil

The results of the variance analysis showed that the application of a combination of NK and P fertilizers had a significant effect on the available-K. Table 2 shows the results of Duncan's test at a significant level of 5% on the available K parameter. Treatment E (¾ dose NK + 1 P + ½ N) showed significantly higher values than treatments A and B, but did not differ significantly from treatment F (1 dose NK + 1 P + ½ N) and I (½ dose NK + ½ single N,P,K).

Treatment E had the highest score of the three treatments (2.45). This is because the K fertilizer added to the soil immediately enters the K equilibrium system where it is soluble and adsorbed. K is easily soluble in water, and equilibrium with the exchanged cations in the soil solution into K^+, which can be exchanged so that it is easily available to the soil (Abdillah *et al.* 2011). The addition of NK and P fertilizers, which were not significantly different from the control treatment, resulted in the loss of nutrients due to leaching, evaporation, and fixation of potassium.

K Absorption

The analysis of variance showed that the application of a combination of NK and P fertilizers had a significant effect on the absorption of K by sweet corn plants, as presented in Table 3. Treatment C (¼ dose NK + 1 P + ½ N) has a K absorption that is not significantly different from that of treatment A (control). The highest K uptake was obtained in treatment E (34.49 mg/plant). This shows that the optimal level of fertilization to increase K absorption is found in treatment E, because higher doses cannot increase K uptake even higher, and this treatment is better than the recommended dose. The nutrient content in the soil in the other treatments was higher than the optimum nutrient content; therefore, the effectiveness of fertilization was lower at higher doses.

The lowest K absorption was obtained for treatment A (control), with an absorption of 1.05. The low absorption of K in treatment A may have been influenced by limited N nutrients in the soil. Plants rely only on the supply of N from the mineralization process of organic matter in the soil, while the total C-organic and N

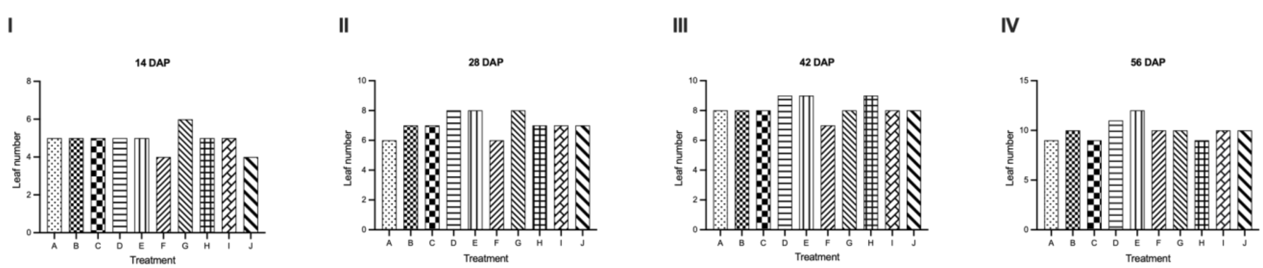

Figure 4 Average leaf number of sweet corn of various treatments at the age of 14, 28, 42, and 56 DAP

Table 2 Effect of NK and P fertilizer doses on K-available soil

	Treatment	K-available in soil (cmol kg^{-1})	
A	Control	1.37	ab
B	Standard N,P,K	1.6	ab
C	¼ Dose NK + 1 P + ½ N	1.44	ab
D	½ Dose NK + 1 P + ½ N	1.77	abc
E	¾ Dose NK + 1 P + ½ N	2.45	d
F	1 Dose NK + 1 P + ½ N	1.82	cd
G	1 ¼ Dose NK + 1 P	1.8	bc
H	1 Dose NK	1.69	abc
I	½ Dose NK + ½ single N,P,K	2.04	cd
J	¾ Dose NK+ ¼ single N,P,K	1.83	bc

Remark: The value followed by the same letter does not differ significantly based on the Duncan Advanced Test at a significant level of 5%.

contents are moderate. Under these conditions, the N that can be supplied by corn plants is limited, so the process of forming vegetative parts of the plant is inhibited, and the absorption of K in plant tissues is not optimal (Mayang *et al.* 2012).

Yield Components

The observed parameters of corn components were length, diameter, weight of cobs with husks, and cob weight without husks. Table 3 shows the results of the analysis of cob length and diameter. The treatment that produced the length of the cob was not significantly different from that of the control, namely the C treatment. According to Noviana (2011), varieties with longer cobs have the chance to give higher yields. The cob length treatment produced in the study was in accordance with the description of sweet corn of the Talenta variety, which was 19.7–23.5 cm (Ministry of Agriculture 2009).

Regarding the diameter of the cob, the treatment with the largest diameter was in the E treatment (5.05 cm). Treatment C had a diameter that was not significantly different from that of the control. The diameter of corncobs at the base, middle, and top was affected by the availability of N for plants (Prisecaru *et al.* 2017). A long cob with a large diameter and many rows of seeds will produce a large weight; therefore, the yield of sweet corn plants will increase based on the nature of the cob.

The next component was the weight of the cob with the husk and the weight of the cob without the husk (Table 5). The weight of a cob is closely related to its diameter and length. Amanullah *et al.* (2016) stated that the filling of corn grains is greatly affected by the availability of potassium, which can be absorbed by plants. Based on Table 4, the weight of the cob with wrinkles in treatment C was not significantly different from the control. The treatment that had the highest weight of the cob with the highest weight was in treatment E with a weight of 0.33 kg/cob, which was higher than the recommended dose (treatment B), but did not differ significantly from treatment D, I, and J.

According to the Ministry of Agriculture (2009), Talenta sweet corn variety has a weight per cob of 0.221–0.337 kg. Based on Table 5, almost all weight treatments per cob corresponded to the description of the Talenta variety. This shows that Talenta variety are responsive to NK and P fertilization in terms of the weight components of cobs, but there is a difference in weight between treatments. Syarifuddin *et al.* (2012) reported that the moisture content and N dose result in a difference in the weight of the cob with husk, the weight of the cob without husk, and the length of the cob, which can also be influenced by genetic factors. The results of the variety analysis showed that there was a significant effect of various treatments on the weight of the cobs

Table 3 Effect of NK and P fertilizer doses on potassium absorption

Treatment		K Absorption (mg/plant)	
A	Control	21.06	a
B	Standard N,P,K	25.07	b
C	¼ Dose NK + 1 P + ½ N	23.55	ab
D	½ Dose NK + 1 P + ½ N	26.12	bc
E	¾ Dose NK + 1 P + ½ N	34.49	d
F	1 Dose NK + 1 P + ½ N	28.86	c
G	1 ¼ Dose NK + 1 P	28.55	c
H	1 Dose NK	25.28	b
I	½ Dose NK + ½ single N,P,K	29.36	c
J	¾ Dose NK+ ¼ single N,P,K	29.15	c

Remark: The value followed by the same letter does not differ significantly based on the Duncan Advanced Test at the significant level of 5%.

Table 4 Effect of NK and P fertilizer doses on cob length and diameter

Treatment		Cob length (cm)		Cob diameter (cm)	
A	Control	15.71	a	3.74	a
B	Standard N,P,K	19.23	cd	4.2	b
C	¼ Dose NK + 1 P + ½ N	16.25	a	3.8	a
D	½ Dose NK + 1 P + ½ N	20.32	ef	4.81	d
E	¾ Dose NK + 1 P + ½ N	21.2	f	5.05	e
F	1 Dose NK + 1 P + ½ N	19.56	cde	4.54	c
G	1 ¼ Dose NK + 1 P	18.79	c	4.11	b
H	1 Dose NK	17.69	b	4.08	b
I	½ Dose NK + ½ single N,P,K	20.08	de	4.69	cd
J	¾ Dose NK+ ¼ single N,P,K	19.73	cde	4.59	c

Remark: The value followed by the same letter does not differ significantly based on the Duncan Advanced Test at a significant level of 5%.

without husks. The results showed that the C treatment did not significantly differ from the control. Meanwhile, treatment E had the highest weight of cobs without husks, which was 0.23 kg/cob and was better than the recommended dose (0.19 kg/cob).

The increase in yield is related to the increase in available-K from the effective dissolution process of the fertilizer material. Potassium plays a role in the regulation of water in cells and the transfer of cations through the membrane. The increase in cob weight is influenced by the effectiveness of photosynthesis and the translocation of photosynthes to the cob. Potassium also plays an important role in plant growth, especially during the ripening period, because it affects photosynthesis during chlorophyll formation and seed replenishment and is essential for carbohydrate formation (Hafsi *et al.* 2014).

The yield capacity of the Talenta variety sweet corn crop is in accordance with the description, which is 18–25 tons/ha, but in this study, the yield capacity was 13.43 tons/ha. Environmental factors that affect the production of sweet corn plants are less than optimal water availability and inhibit the growth of sweet corn plants.

Corn Sweetness Index (Brix)

The sugar content of sweet corn determines its quality. The quality of the results was measured in terms of the sugar content. Table 6 shows that various treatments affect the sugar content of sweet corn. Treatment E was significantly different from A and B but not significantly different from D, I, and J treatments. The highest average % Brix was found in treatment E, whereas the lowest average was in A. These show that treatment E can be a fertilization recommendation to increase the sweetness of new corn and replace the current recommended dose.

Cahya *et al.* (2018) found that the Talenta variety has a sugar content of around 15.75%. However, in this study, the highest percentage Brix was 13.56%. This is because there are other factors that have a less optimal effect on the growth of sweet corn besides the potassium element in the fertilizer, which plays a role in the sugar formation process and the transportation of

Table 5 Effect of NK and P fertilizer doses on the weight of cob with husks and cob weights without husks

Treatment		Weight of cob with husk (kg/cob)		Weight of cob without husk (kg/cob)	
A	Control	0.18	a	0.14	a
B	Standard N,P,K	0.26	bc	0.19	bc
C	¼ Dose NK + 1 P + ½ N	0.2	ab	0.15	a
D	½ Dose NK + 1 P + ½ N	0.3	de	0.21	de
E	¾ Dose NK + 1 P + ½ N	0.33	e	0.23	e
F	1 Dose NK + 1 P + ½ N	0.28	cd	0.19	bc
G	1 ¼ Dose NK + 1 P	0.24	bc	0.18	b
H	1 Dose NK	0.22	b	0.18	b
I	½ Dose NK + ½ single N,P,K	0.3	de	0.21	cd
J	¾ Dose NK+ ¼ single N,P,K	0.29	de	0.2	cd

Remark: The value followed by the same letter does not differ significantly based on the Duncan Advanced Test at a significant level of 5%.

Table 6 Effect of NK and P fertilizer doses on Brix

Treatment		Brix (%)	
A	Control	8.33	a
B	Standard N,P,K	11.00	bc
C	¼ Dose NK + 1 P + ½ N	9.33	ab
D	½ Dose NK + 1 P + ½ N	12.00	cd
E	¾ Dose NK + 1 P + ½ N	13.56	d
F	1 Dose NK + 1 P + ½ N	11.22	bc
G	1 ¼ Dose NK + 1 P	10.56	bc
H	1 Dose NK	9.99	abc
I	½ Dose NK + ½ single N,P,K	11.67	cd
J	¾ Dose NK+ ¼ single N,P,K	11.55	cd

Remark: The value followed by the same letter does not differ significantly based on the Duncan Advanced Test at a significant level of 5%.

photosynthetic sugar in plants. The availability of water also affects the sweetness level, apart from the influence of temperature. Sugar content in sweet corn kernels is affected by plant and environmental factors. Plant factors include the genotype used, whereas environmental factors include soil, temperature, light availability, and water.

CONCLUSION

The application of NK and P fertilizers in Inceptisol soil in Jatinangor can increase the growth of Talenta sweet corn, including plant height, canopy diameter, stalk diameter, and number of leaves, significantly affecting K-available in soil, K absorption, and sweet corn yield components, such as cob weight with husk, cob weight without husk, cob diameter, cob length, and sweet corn brix percentage. The highest results were achieved in treatment E with a dose of ¾ dose NK + 1 P + ½ N which could increase the tested parameters, namely soil K-available (2.45 cmol kg^{-1}), K-uptake (34.49 mg/plant), and yield components such as cob length (21.2 cm), cob diameter (5.05 cm), cob weight with husks (0.33 kg/cob), cob weight without husk (0.23 kg/cob), and brix by 13.56%. This study provides new recommendations related to the fertilization of corn plants to increase the growth and yield of corn in Inceptisols.

REFERENCES

Abdillah A, Jauhari S, Damasus R, Slamet M. 2011. Pengaruh pupuk zeolit dan kalium terhadap ketersediaan dan serapan k di Lahan Berpasir Pantai Kulonprogo, Yogyakarta. ISSN: 2088-110X, E-ISSN: 2088-2475.

Amanullah, Asif I, Irfanullah, Zeeshan H. 2016. Potassium management for improving the growth and grain yield of maize (*Zea mays* L.) under moisture stress conditions. *Sci. Reports.* 6: 34627. https://doi.org/10.1038/srep34627.

Badan Pusat Statistik. 2018. Luas Panen Jagung Menurut Provinsi, 2014 – 2018. Hasil Rakor di Solo tanggal 25–27 Juli 2018.

Cahya EJ, Ninuk H. 2018. Uji potensi enam varietas jagung manis (*Zea mays saccharata Sturt*). *Jurnal Produksi Tanaman*. 6(1): 92–100.

Fi'liyah, Nurjaya, Syekhfani. 2016. Pengaruh pemberian pupuk KCl terhadap N, P, K tanah dan serapan tanaman pada inceptisols untuk tanaman jagung di Situ Hilir, Cibungbulang, Bogor. *Jurnal Tanah dan Sumberdaya Lahan.* 3(2): 329–337. https://doi.org/10.1007/s11738-014-1491-2.

Hafsi C, Ahmed D, Chedly A. 2014. Potassium deficiency in plants: effects and signaling cascades. *Acta Physiologiae Plantarum*. 36(5): 1055–1070. Abdillah A, Jauhari S, Damasus R, Slamet M. 2011. Pengaruh pupuk zeolit dan kalium terhadap ketersediaan dan serapan k di Lahan Berpasir Pantai Kulonprogo, Yogyakarta. ISSN: 2088-110X, E-ISSN: 2088-2475.

Amanullah, Asif I, Irfanullah, Zeeshan H. 2016. Potassium management for improving the growth and grain yield of maize (*Zea mays* L.) under moisture stress conditions. *Sci. Reports.* 6: 34627. https://doi.org/10.1038/srep34627.

Badan Pusat Statistik. 2018. Luas Panen Jagung Menurut Provinsi, 2014 – 2018. Hasil Rakor di Solo tanggal 25–27 Juli 2018.

Cahya EJ, Ninuk H. 2018. Uji potensi enam varietas jagung manis (*Zea mays saccharata Sturt*). *Jurnal Produksi Tanaman*. 6(1): 92–100.

Fi'liyah, Nurjaya, Syekhfani. 2016. Pengaruh pemberian pupuk KCl terhadap N, P, K tanah dan serapan tanaman pada inceptisols untuk tanaman jagung di Situ Hilir, Cibungbulang, Bogor. *Jurnal Tanah dan Sumberdaya Lahan.* 3(2): 329–337. https://doi.org/10.1007/s11738-014-1491-2.

Hafsi C, Ahmed D, Chedly A. 2014. Potassium deficiency in plants: effects and signaling cascades. *Acta Physiologiae Plantarum*. 36(5): 1055–1070.

Kriswantoro HE, Safitriyani, Bahri. 2016. ://doi.org/10.21082/btsm.v9n1.2017.34-41.

Utomo M, Sudarsono, Bujang R, Tengku S, Jamalam L, Wawan. 2015. *Ilmu Tanah* (*Dasar-dasar dan Pengelolaannya*). Jakarta: Prenadamedia. 433 pp.

Xiong H, Xiong Y, Zhang G, Peng Z, He S, Xu D, Liu W. 2017. Effects of nitrogen, phosphorus and potassium on yield of sweet corn. In 2017 International Conference on Material Science, Energy and Environmental Engineering (MSEEE 2017) (pp. 211–214). Atlantis Press. https://doi.org/10.2991/mseee-17.2017.39.

Kriswantoro HE, Safitriyani, Bahri. 2016. ://doi.org/10.21082/btsm.v9n1.2017.34-41.

Utomo M, Sudarsono, Bujang R, Tengku S, Jamalam L, Wawan. 2015. *Ilmu Tanah* (*Dasar-dasar dan Pengelolaannya*). Jakarta: Prenadamedia. 433 pp.

Xiong H, Xiong Y, Zhang G, Peng Z, He S, Xu D, Liu W. 2017. Effects of nitrogen, phosphorus and potassium

on yield of sweet corn. In 2017 International Conference on Material Science, Energy and Environmental Engineering (MSEEE 2017) (pp. 211–214). Atlantis Press. https://doi.org/10.2991/mseee-17.2017.39.