

Conference Paper

Improving Vegetative Growth of Sweet Corn Through Filter Cake and Potassium Application

I. S. W. Atmaja*, D. Nurmanah, A. Faqih and A. Jaenudin

Universitas Swadaya Gunung Jati, Cirebon, Indonesia

ORCID ID :Ida Setya Wahyu Atmaja : <https://orcid.org/0000-0003-3968-713X>Diana Nurmanah : <https://orcid.org/0000-0003-2609-0203>Achmad Faqih : <https://orcid.org/0000-0002-6257-534X>Amran Jaenudin : <https://orcid.org/0000-0002-3013-9631>**Abstract.**

Corn is a widely consumed cereal crop. To improve plant growth and yield, repairing the cultivation technique and environmental modification can be done through organic or inorganic fertilizer addition. The aim of this research was to identify an interaction between potassium and filter cake to corn vegetative growth. This research used Factorial Randomized Block Design with two factors. The first factor was the filter cake dose (0, 10, and 20 tone ha⁻¹ and second factor is potassium dose (100, 150, and 200 kg ha⁻¹). There were nine treatments, and they were repeated three times. The variables analyzed were vegetative growth such plant height, number of leaves, length, and volume root. The result showed that a combination of filter cake (20 tone ha⁻¹) and potassium (150 kg ha⁻¹) had the highest plant height at 42 DAP. Potassium independently affected the number of leaves at 24 and 48 DAP. Length of root was independently effected by filter cake application.

Keywords: filter cake, pottasium, sweet cornCorresponding Author: I. S. W.
Atmaja; email:
iedaatmaja@gmail.com**Published** 27 December 2022Publishing services provided by
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1. INTRODUCTION

Corn is a cereal crop that's widely consumed besides rice and wheat. Cereal crops provide energy and some nutrient trough human consumption and meat production, since cereal crops consumed for livestock feed. [1]. Now days corn become important crops, it's have high economic value and adaptable in different ecosystem [2]. Globally, the increasing demand of corn need some efforts to increasing productivity on farm. Repairing of cultivation technique and environment modification can be done by fertilization both organic or inorganic fertilizer.

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Potassium is macronutrient needed by crops. It's can improve nutrient use, plant growth, yield, water use efficiency by corn [3]. Potassium is ionic nutrient that have main role to turgor maintenance and it's also improve maximum leave extension and stem elongation [4]. Twenty five percent potassium of corn is in seeds after harvest and the rest spread in stem and cobs [5].

In addition of potassium, the utilization of filter cake can be used to repairing environment to improve growth and corn yield. Filter cake produced in sugar processing during juice clarification [6] and commonly filter cake as waste in sugar industry. Filter cake contain many macronutrient and micronutrient needed by plant, It's also rich of organic matter and phosphor [7]. Soil physics characteristic, such soil structure, bulk density can be modified by filter cake utilization [8]. Report that utilization of filter cake increasing soil organic matter, micronutrient concentrations and corn yield. Although filter cake has many advantages, but it not using widely.

Based on some research about potassium and filter cake utilization, not known respectly how the interaction effect of both to corn vegetative growth. The aim of this research is to identify an interaction effect of potassium dan filter cake to corn vegetative growth.

2. METHODS

Field research was conducted in Gebang sub district, Cirebon on Mei to August 2020. The material and tools needed are seeds of corn Exotic var., furadan, filter cake, inorganic fertilizer such Urea (350 kg ha^{-1}), SP-36 (150 kg ha^{-1}), and KCl (according of treatment), caliper, ruler, camera.

This research used Factorial Randomized Block Design with two factors. First factors are fiter cake dose (0, 10, and 20 tone ha^{-1} and second factor is potassium dose (100, 150, and 200 kg ha^{-1}). KCl as inorganic fertilizer used as source of potassium. There was 9 treatment and repeated three times. Filter cake applied at 7 days before planting same time with second soil tillage. While KCL inorganic fertilizer applied at 7 and 21 days after planting (DAP). Two seeds in plant hole were planted and thinned at 7 DAP.

The variables analysis in this research is vegetative growth such plant height, number of leaves, length, and volume root. Plant height and number of leaves are the result of five sample plant and carried out at 14, 28, and 42 DAP. Destructive analysis was carried out to analyze length and volume of root at 42 DAP.

3. RESULTS AND DISCUSSION

3.1. Plant Height

Based on statistical analysis show that there was no interaction filter cake and potassium to plant height at 14 and 28 DAP. But independently there was effect of potassium to plant height at 42 DAP (Table 1).

TABLE 1: Plant height at 14 and 28 DAP.

Treatment	Average of Plant Height (cm)	
	14 DAP	28 DAP
B1 = 0 tone ha ⁻¹	17.97 a	68.89 a
B2 = 10 tone ha ⁻¹	17.57 a	68.57 a
B3 = 20 tone ha ⁻¹	17.53 a	67.42 a
K1 = 100 kg ha ⁻¹	17.31 a	66.47 a
K2 = 150 kg ha ⁻¹	17.48 a	70.67 b
K3 = 200 kg ha ⁻¹	18.28 a	67.74 a

Notes: The number that followed by same letters was not significantly different by using F test at 5%.

Based on Table 1, potassium significantly affected to average of plant height. Potassium fertilizer with dose 150 kg ha⁻¹ have highest plant height as 70.67 cm. In this research find that if potassium was increasing as 50 kg ha⁻¹, the average of plant height will be decreasing. This phenomenon shown the characteristic of potassium, luxury consumption, where an increasing potassium uptake not linear with increasing of production.

At 42 DAP statistical analysis show an interaction both of treatment to plant height (Table 2). Combination treatment of filter cake (20 tone ha⁻¹) and potassium (150 kg ha⁻¹) have highest plant height as 184.4 cm. With filter cake utilization, the added of potassium fertilizer until 150 kg ha⁻¹ will be increasing plant height. But there was decreasing of plant height if the dose of potassium increasing more than 150 kg ha⁻¹.

Filter cake is organic matter as source of plant nutrient and it used as fertilizer [9,10]. Through filter cake utilization, there was efficiency of inorganic fertilizer by improving physic, chemical, and biological soil properties [7,11]. Improvements of soil structure lead the absorption of nutrient plant.

TABLE 2: Plant height at 42 DAP.

		Filter Cake	
Potassium	B0 0 tone ha ⁻¹	B1 10 tone ha ⁻¹	B2 20 tone ha ⁻¹
K1 100 kg ha ⁻¹	179,77 a	177,3 a	177,23 a
	BC	A	A
K2 150 kg ha ⁻¹	180,63 a	182,3 c	184,4 b
	A	B	C
K3 200 kg ha ⁻¹	180,33 a A	179,57 b B	176,5 a A

Notes: The number that followed by same letters was not significantly different by Duncan test at 5%.

4. Number of Leaves

Leaves is vital organ as place of photosynthetic. Nutrient absorption affected the growth of leaves. Table 3 show the affected of both treatment to number of leaves at 14, 28, and 42 DAP.

TABLE 3: Number of leaves at 14, 28, and 42 DAP.

Treatment	Average Number of Leaves		
	14 DAP	28 DAP	42 DAP
B1 = 0 ton ha ⁻¹	4.36 a	8.20 a	11.22 a
B2 = 10 ton ha ⁻¹	4.31 a	8.20 a	11.20 a
B3 = 20 ton ha ⁻¹	4.36 a	8.16 a	11.20 a
K1 = 100 kg ha ⁻¹	4.36 a	7.96 a	11.02 a
K2 = 150 kg ha ⁻¹	4.22 a	8.49 b	11.49 b
K3 = 200 kg ha ⁻¹	4.44 a	8.11 a	11.11 b

Note: The number that followed by same letters was not significantly different by using F test at 5%.

Based on Table 3 known that there was not an interaction between filter cake and potassium added to number of leaves in all time analysis. Independently, potassium effected to number of leaves at 28 and 42 DAP. Soil analysis pre research show that nitrogen content at the field is 0.14% (low), P₂O₅ 272,0 ppm (high), K 128,1 ppm (medium). Filter cake added have not been able to provide nitrogen for plant growth. It's also supported by nitrogen content on filter cake, that's only 1.58% (low). Structure of molecule chlorophyl are nitrogen and magnesium.

Photosynthesis also depends on potassium availability. Potassium have main role for photosynthesis process and stomata opening in leaves Potassium deficiency reducing both of number of leaves and individual leaves size [12]. Independently, potassium significantly affected to number of leaves at 28 and 42 DAP. In this research find that best dose to improve number of leaves is 150 kg ha⁻¹. As ionic nutrient, potassium have

an important role to plant physiological processes and uptake of other nutrients [13], leaf expansion [14].

4.1. Length and Volume of Root

Table 4 show the effect of filter cake and potassium to root characteristic of corn, both length and volume of root. Independently, length or root effected by filter cake addition. B₁(without filter cake) have lowest length of root and this value increasing where filter cake added.

TABLE 4: Length and volume of root.

Treatment	Length of Root (cm)	Volume of Root (ml)
B1 = 0 ton ha ⁻¹	27.29 a	10.51 a
B2 = 10 ton ha ⁻¹	28.49 b	10.82 a
B3 = 20 ton ha ⁻¹	28.61 b	10.60 a
K1 = 100 kg ha ⁻¹	28.22 a	10.58 a
K2 = 150 kg ha ⁻¹	27.97 a	10.67 a
K3 = 200 kg ha ⁻¹	28.20 a	10.69 a

Note: The number that followed by same letters was not significantly different by using F test at 5%.

Filter cake is one of organic matter. It has main role to repairing and improving of physical, chemical, and biological soil properties. Filter cake application make soil structure more friable and make best condition for root growth. In line with [3] filter cake can improve physic soil properties, so it can support root growth.

5. CONCLUSION

As a cereal crops, corn need some nutrient to support plant growth. Application of filter cake and potassium increasing plant height, number of leave and length of root. Combination of filter cake (20 tone ha⁻¹) and potassium (150 kg ha⁻¹) have highest plant height at 42 DAP. While potassium independently effected to number of leaves at 24 and 48 DAP. Length of root also independently effected by filter cake application.

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