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Effects of Chicken Compost and KCl Fertilizer on Growth, Yield, Post-Harvest Quality of Sweet Corn and Soil Health

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ABSTRACT

This study aimed to determine the effects of chicken compost and KCl fertilizer application on the growth, yield, post-harvest quality of sweet corn (*Zea mays* L. var. *saccharata*), soil respiration and microbial population. The research was arranged according to a Factorial Random-Block Design consisting of two factors and three replications. The first factor was the dose of chicken compost (0 and 15 t/ha) and the second the dose of KCl fertilizer (0, 50, 100 and 150 kg/ha). The results showed that chicken compost stimulated the growth, yield, postharvest quality of sweet corn, respiration, and microbial activity of soil. KCl fertilizer increased SPAD values linearly and quadratically chlorophyll pigment, β-carotene, yield components, and yield. KCl fertilizer did not affect soil respiration, fungi, or bacteria populations. The use of chicken compost reduced the need for KCl fertilization by 25%. Therefore, the integration of organic and inorganic fertilizers are recommended to be applied by farmers in the tropics.

INTRODUCTION

Sweet corn (*Zea mays* L. var. *saccharata*) demand continues to rise as the world population grows rapidly. Sweet corn production in Indonesia is not stable nor at optimal production. The low production of sweet corn is based on decreased soil fertility. Most agricultural land used for corn cultivation in Lampung Province is Ultisol. Ultisol soil has low soil organic content (Yulnafatmawita, Adrinal, & Anggriani, 2013). The efforts necessary to improve soil fertility are, among others, adding organic materials and fertilizer. Growers apply two types of fertilizers, namely inorganic and organic. Organic manures derived from chicken compost are mainly employed in tropical areas as the source of organic matter. Application of organic compost plays a direct role in improving physical (Adekiya, Agbede, Aboyeji, Dunsin, & Simeon, 2019; Khairuddin, Isa, Zakaria, & Rani, 2018), chemical (Yousefzadeh, Sanavy, Govahi, & Oskooie, 2015) and biological properties of soil (García-Orenes et al., 2016; Lazcano, Gómez-Brandón, Revilla, & Domínguez, 2013).

Potassium (K) is a macro plant nutrient, like N and P. The crop response to K fertilization not only results in greater production, but also improves the quality of crops (Zörb, Senbayram, & Peiter, 2014). K is involved in the functioning of enzymes, photosynthesis and fruit formation (Mengel & Kirkby, 2001) as well as stress resistance of all crops (Zörb, Senbayram, & Peiter, 2014). The positive effects of K on growth, yield, and quality of corn have been widely reported (Mallarino, Bergmann, & Kaiser, 2011; Qiu et al., 2014). However, there is not enough literature on the impact of K on sweet corn grown on Ultisol tropical soils.

Continuous use of inorganic fertilizers that are not balanced with organic fertilizers renders soil fertility low. One way to improve soil fertility is by adding organic material. Several authors (Antonious, Turley, Hill, & Snyder, 2014; Hepperly, Lotter, Ulsh,

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Seidel, & Reider, 2009) found how chicken compost became one of the most positive organic fertilizers in terms of influence on improving the physical, chemical and biological properties of soil. Also, chicken compost can support soil microorganisms. Higher crop growth, yield and product quality about the application of organic manures have been extensively described (Jannoura, Joergensen, & Bruns, 2014; Ram, Singh, & Sirari, 2016; Riahi et al., 2009).

The addition of organic and inorganic fertilizers as an alternative for farmers is expected to enhance the production of sweet corn without damaging the environment and maintaining optimal levels of soil fertility. Research on integrated organic and inorganic fertilizers have been conducted already (Khairuddin, Isa, Zakaria, & Rani, 2018; Santosa, Maghfoer, & Tarno, 2017). However, a review of the literature has demonstrated that little information is available on the effect of chicken compost and K fertilizers in Ultisol soil. With this in mind, the present work sought to determine the impact of combined application of chicken compost and KCl fertilizer on the growth, nutrient uptake, yield, postharvest quality of sweet corn and soil health as indicated by soil respiration and microbial populations.

MATERIALS AND METHODS

The research was conducted in the experimental station at Kota Sepang, Bandar Lampung, Indonesia. The land used is the Ultisol soil type. The fieldwork was carried out during the rainy season in December 2016 until March 2017. Soil analysis was performed at Soil Science Laboratory, Soil Department, Faculty of Agriculture, Universitas Lampung, Bandar Lampung, Indonesia, and measurement of pigment content was at the Integrated Laboratory and Innovation Center of Technology, Universitas Lampung. Soil respiration measurement and soil microbial population assessment were carried out at the Soil Biology Laboratory, Universitas Lampung. The materials in this research were sweet corn seed cultivar Jambore, composted chicken compost (pH = 7.37; C-Organic = 19.57%, N = 1.04%, P_2O_5 = 0.98%, K_2O = 0.27%) and inorganic fertilizer (Urea, SP36, KCl).

This research was based on a Factorial Random-Block Design (2 x 4) with three replicates. The first factor was without chicken compost and 15 t/ha chicken compost; and the second factor was doses of KCl at 0, 50, 100, and 150 kg/ha. Bartlett's test evaluated the homogeneity of the variance between treatments, and the data aditivity was assessed by the Tukey test. Further testing was employed with orthogonal polynomials to determine the optimum dose of KCl fertilizer for vegetative and generative parameters, except concerning postharvest quality and soil health parameters.

The work was commenced with the preparation of the land and clearing weeds. Next, the soil was dug at a depth of 15-20 cm, and the spacing used was 70 cm x 20 cm. Weeding was manually engaged in. During the study, the land was established to be relatively free of pests and diseases. The recommended dosage of inorganic fertilizer used was 300 kg/ha Urea applied twice at one and four weeks after planting (WAP); 150 kg/ha SP36 and KCl fertilizer were applied at 1 WAP following treatments. Harvesting was executed when the sweet corn was 70 days after planting (DAP).

The parameters observed in this experiment were: (1) plant height (cm) at 6 WAP; (2) leaf number (blade) at 6 WAP; (3) leaf greenness with chlorophyll meter (SPAD value) at 8 WAP; (4) total chlorophyll content (mg/g fresh weight) and β-carotene content (μmol/g) (modified procedure from Lobato et al. (2010)); (5) maximum K vegetative leaf absorption (formula: nutrient content of sweet corn leaves (%) x dry weight (g)); (6) dry weight (g); (7) row length (cm); (8) number of rows per ear (row); (9) total production (t/ha); (10) soluble solids (°Brix) at days 70, 73 and 75 DAP measured by refractometer; (11) soluble solids loss (%); (12) respiration of the soil (mg/h/m^2) at 0, 15, 30, 45, 60 and 70 DAP by a modified Verstraete method (Verma, Yadav, Singh, Suman, & Gaur, 2010); and (13) number of microbial populations (10^{-8} cfu/ml) at 0, 30 and 70 DAP assessed via the agar cup method (Upadhyay et al., 2016).

RESULTS AND DISCUSSION

Initial soil analysis showed that soil pH was 6.16, a slightly acidic pH category, and the C-organic content to be 1.04%, meaning that the C-organic in the soil used of this research is low. Other chemicals were N-total, P-available, K-total, and CEC, which were 0.10%, 2.38 ppm, 0.20 ml/100 g, and 7.31 ml/100 g, respectively, whereas the saturation base was 32.15%, the low category. Based on the initial soil analysis, the results indicated that fertilizer was

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necessary for the addition of nutrients that were still low and to maintain soil fertility.

The orthogonal polynomial test showed that the effect of chicken compost and KCl fertilizer application increased vegetative growth of sweet corn, reflected by plant height, number of leaves, leaf area index, SPAD level, total chlorophyll and β-carotene (Table 1). The plant height (Fig. 1A), number of leaves (Fig. 1B), leaf area index (Fig. 2A) and SPAD level (Fig. 2B) after treatment application by chicken compost were all higher than without chicken compost.

Table 1. Orthogonal polynomial test of chicken compost and KCl fertilizer on the vegetative phase

Treatment	Plant height	Number of leaves	Leaf area index	SPAD level	Total chlorophyll content	β–carotene content
Chicken Compost (C)						
A1: C0 (without compost) vs C1 (with compost)	10.92**	28.03**	57.16**	64.60**	4427.87**	58.91**
KCl Fertilizers (K)						
A2: K-Linear	83.97**	43.09**	134.23 **	44.72**	790.91**	21.59**
A3: K-Quadratic	3.80ns	0.23ns	27.65 **	4.24ns	139.90**	6.67*
C x K Interactions						
A4: A1 x A2	0.47ns	5.01*	7.86 *	8.15*	1.07**	7.49*
A5: A1 x A3	2.90ns	0.95ns	0.05ns	1.31ns	3.63**	2.44ns

Remarks: ** = F-count different at the 1 % level, * = F-count different at the 5 % level, ns = Not significantly different at the 5%

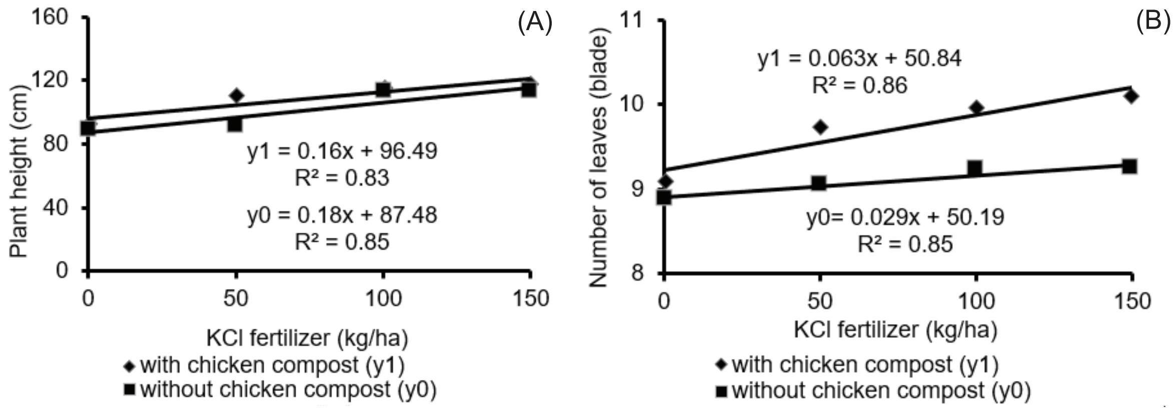

Fig. 1. Interaction effects of chicken compost and KCl fertilizer on plant height (A) and number of leaves (B)

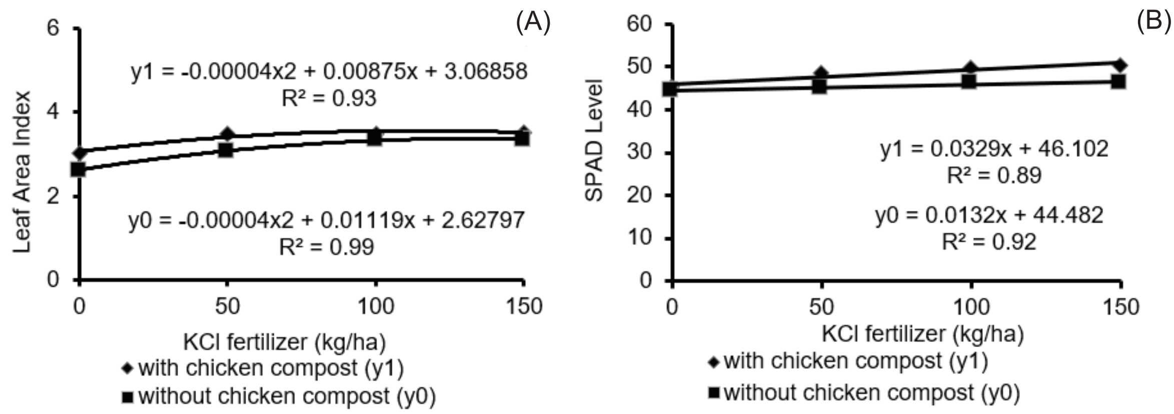

Fig. 2. The interaction effects of chicken compost and KCl fertilizer on leaf area index (A) and SPAD level (B)

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Table 2 presents the data underlying how the application of chicken compost increased plant height and number of leaves by 16.78% and 6.82%, respectively than without chicken compost. Fig. 1A and 1B depict the application of chicken compost and fertilizer KCl elevating plant height and number of leaves linearly. After application of chicken compost, plant height and number of leaves at 96.49 cm and 50.84 blades, respectively, increased by 0.16 cm and 0.06 blades for each application of fertilizer KCl 1 kg/ha. The application of chicken compost and KCl rose plant height and leaf number because higher plants will have more leaves, thereby affecting the surface area of sweet corn leaves. The function of chicken compost is to enhance the absorption and holding a capacity of water so that the roots more easily absorb nutrients contained in the soil (Setiyo et al., 2016). Nutrients that are absorbed will be used by plants to increase the vegetative growth of the plant.

KCl fertilizer enhances the vegetative phase of sweet corn because the nutrient potassium regulates the physiological processes of the plants (Zörb, Senbayram, & Peiter, 2014) and forms a stronger stem that supports generative growth. This is supported by the results of research by Khan, Akhtar, Mahmood-ul-Hassan, Mahmood, & Safdar (2012) which stated that the application of K fertilizer increased the plant height and the number of branches of potato plants compared with the control.

Table 2 shows that the application of chicken compost increases the leaf area index and SPAD level greater than 9.35% and 6.82%, respectively than without chicken compost. Based on orthogonal polynomials, it is shown that with increasing doses of KCl fertilizer, there was a rise in leaf area index quadratically (Fig. 2A), and a maximum leaf area index of 3.69 was obtained with the treatment of chicken compost 15 t/ha and KCl 125 kg/ha. Fig. 2B portrays how SPAD level increases linearly with the application of chicken compost, leading to a SPAD level of 46.10 and increasing by 0.032 for each application of 1 kg/ha KCl.

The application of chicken compost increases chlorophyll and β-carotene content by 63.87% and 30.11%, respectively, more than without (Table 2). Fig. 3A and 3B depict the application of chicken compost and KCl fertilizer, increasing chlorophyll and β-carotene content quadratically. The content of chlorophyll and β-carotene reaches a maximum of 2.78 mg/g and 456.23 mg/g with the treatment of chicken compost 15 t/ha and KCl fertilizer 112.5 kg/ha and chicken compost 15 t/ha and KCl 116.5 kg/ha, respectively.

Table 2. Mean and difference value of chicken compost treatment on the vegetative phase

Treatment	Plant height (cm)	Number of leaves (blades)	Leaf area index	SPAD level (%)	Total chlorophyll content (mg/l)	β–carotene content (μmg/l)
Without chicken compost	101.58	9.09	3.10	45.47	1.55	312.37
With chicken compost	118.63	9.71	3.39	48.57	2.54	406.43
% difference	16.78	6.82	9.35	6.82	63.87	30.11

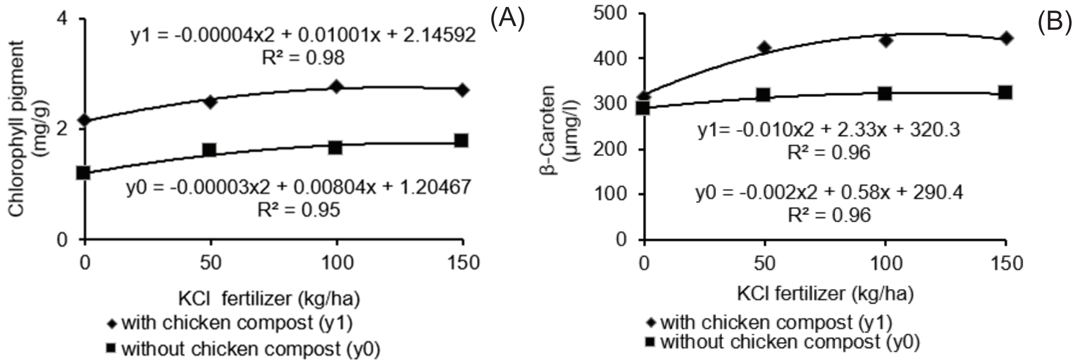

Fig. 3. The interaction effects of chicken compost and fertilizer KCl on chlorophyll pigment (A) and β-carotene pigment (B)

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The application of chicken compost and KCl fertilizer increased leaf area index, SPAD level, chlorophyll content, and β-carotene (Table 1). Photosynthesis activity increases in the case of sufficient K (Hu et al., 2015). Manure compost is a robust source of plant nutrients (Han, An, Hwang, Kim, & Park, 2016). The addition of organic materials improves the plant rhizosphere, making the soil structure crumble and soil aeration better, so that root plants more easily absorb K nutrients. During the process of photosynthesis, K has a role in increasing vegetative growth and leaf area index. K stimulates opening and closing of the stomata and maintaining cellular turgor, plant cell strength while also ensuring guarding cells surrounding the stomata remain open so that carbon dioxide enters into the leaves where carbon is converted into sugar (Oosterhuis, Loka, Kawakami, & Pettigrew, 2014; Zörb, Senbayram, & Peiter, 2014).

The morphology of leaves affects the absorption of light. The wider morphology of leaves allows maximum absorption of light so that all cells will be able to synthesize chlorophyll (Rezai, Etemadi, Nikbakht, Yousefi, & Majidi, 2018). The wider leaf surface area will also be more efficient in terms of capturing light and increasing the activity of enzymes that play a role in chlorophyll and carotenoid biosynthesis. Lobato et al. (2010) reported that chlorophyll pigment affects the rate of photosynthesis.

Table 3 presents the orthogonal polynomial test regarding the application of chicken compost and KCl fertilizer increasing nutrient uptake of leaf K, yield components (dry weight per plant, row length, number of rows per ear) and yield. Table 4 shows that the application of chicken compost makes K uptake of sweet corn leaves and dry weight per plant higher by 17.18% and 16.80%, respectively than without. Fig. 4A shows that with the application of chicken compost and increasing doses of KCl 1 kg/ha fertilizer, there is an increase in K uptake of sweet corn leaves by 0.063 g/ml, and a rise in dry plant weight by 0.002 g (Fig. 4B).

Chicken compost and KCl fertilizer increase the K uptake and dry weight per plant. Nutrient content in chicken compost consists of N, P, K so that the combination of chicken compost and KCl fertilizer increased the uptake of potassium nutrients in sweet corn leaves. This is supported by Hu et al. (2015), who showed that K application increased leaf K concentration. The application of chicken compost increases row length and the number of rows per ear, respectively, by 11.31% and 6.88% compared to without (Table 4). The application of chicken compost and KCl fertilizer increase row length quadratically (Fig. 5A) and the number of rows per ear linearly (Fig. 5B). A maximum row length of 18.47 cm was obtained with the treatment of chicken compost 15 t/ha of KCl fertilizer 127 kg/ha.

Based on the orthogonal polynomial testing results, the yield of sweet corn treated with chicken compost was 12.25% higher than without (Table 4). Fig. 6 shows that with the increasing dose of KCl fertilizer, there is a concomitant quadratic rise of the yield. The maximum production of 18.94 t/ha obtained through treatment without chicken compost and KCl 135.14 kg/ha, whereas the application of chicken compost 15 t/ha and KCl 105.17 kg/ha resulted in maximum production of 19.45 t/ha

Table 3. Orthogonal polynomial test of chicken compost and KCl fertilizer on the generative phase of sweet corn

Treatment	K uptake of leaves	Dry weight per plant	Row length	Number of rows per ear	Yield
Chicken Compost (C)					
A1: C0 (without compost) vs C1 (with compost)	36.24**	172.24**	222.47**	45.87**	51.35**
KCl Fertilizers (K)					
A2: K-linear	33.74**	24.33**	282.05**	73.53**	178.34**
A3: K-Quadratic	0.09ns	0.44ns	44.90**	9.56**	37.86**
C x K Interactions					
A4: A1 x A2	10.86**	9.78**	27.25**	1.42ns	30.16**
A5: A1 x A3	0.00ns	0.40ns	12.66**	9.12**	0.87ns

Remarks: ** = F-count different at the 1 % level, * = F-count different at the 5 % level, ns = Not significantly different at the 5%

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Table 4. Mean and difference value of chicken compost treatment on the generative phase

Treatment	K uptake of leaves (g/ml)	Dry weight per plant (g)	Row length (cm)	Number of rows per ear (row)	Yield (t/ha)
Without chicken compost	27.18	9.88	17.41	45.92	16.33
With chicken compost	31.85	11.54	19.38	49.08	18.33
% difference	17.18	16.80	11.31	6.88	12.25

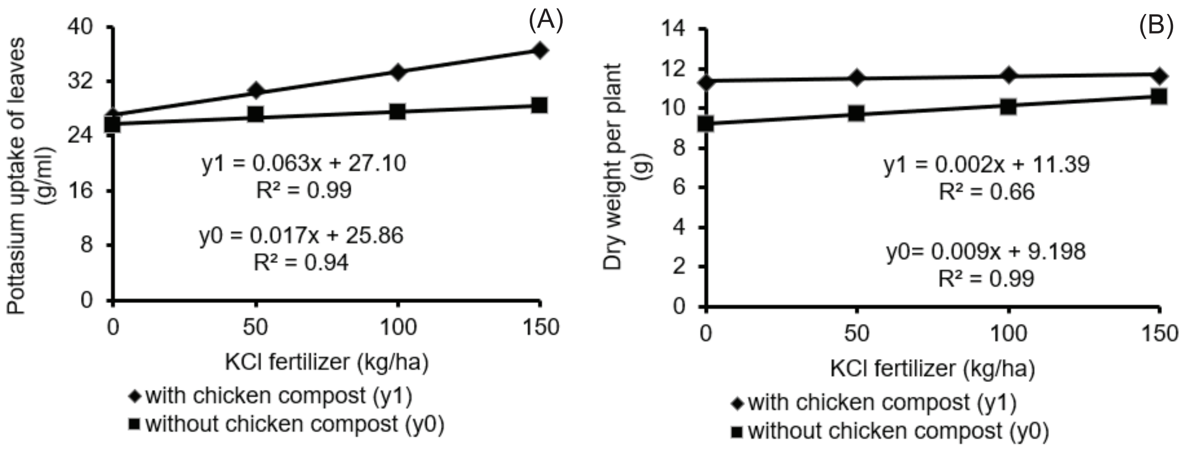

Fig. 4. The interaction effects of chicken compost and KCl fertilizer on K uptake of sweet corn leaves (A) and dry weight per sweet corn plant (B)

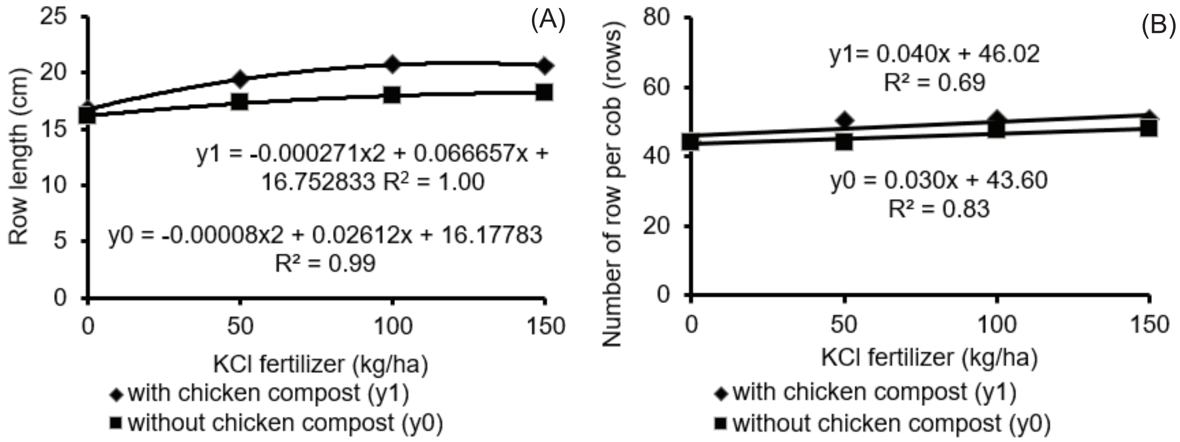

Fig. 5. The interaction effects of chicken compost and KCl fertilizer on row length (A) and number of rows per cob of the sweet corn plant (B)

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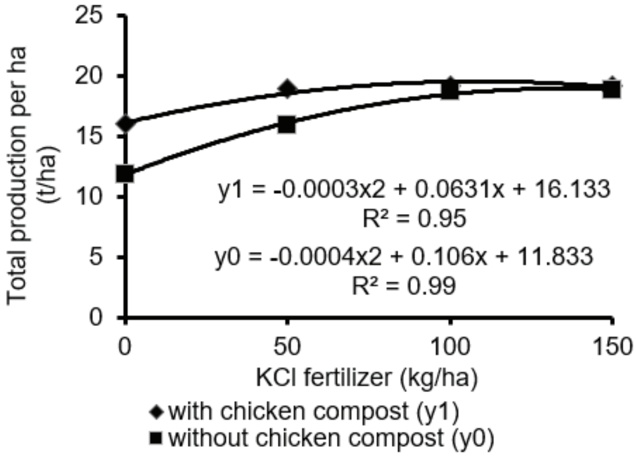

Fig. 6. Interaction effects of chicken compost and KCl fertilizer on total production per ha

The application of chicken compost reduced the use of KCl fertilizer by 25 % (Fig. 6). Chicken compost not only contains a complete set of nutrients, but also improves the chemical, biological and physical properties of soil (Hossain, von Fragstein, von Niemsdorff, & Heß, 2017) so that plants grow optimally. Chicken compost supplies N, P, and K in available forms to plants through biological decomposition (Pitta et al., 2012). Major nutrients, namely N, P, and K, are needed by plants to support vegetative and generative growth.

Organic fertilizers affect the quantity of sweet corn. Chicken compost is an organic material that is of high quality and easily decomposes. This is supported by Adekiya, Agbede, Aboyeji, Dunsin, & Simeon (2019), who stated that the application of chicken compost enhanced the production of radish. The balance of organic and inorganic fertilizer use is the key to managing soil nutrients properly. Santosa, Maghfoer, & Tarno (2017) noted that the application of inorganic fertilizer is a faster way to maintain the productivity of crops because the nutrients are easily available to plants. Similar results surrounding integrated inorganic and organic fertilizer use is also reported for early-maize by Babaji et al. (2014) and baby corn by Sharma & Banik (2014).

Table 5 features the observations of solid soluble content as an indicator of sucrose levels, indicating that chicken compost treatment leads to significantly higher sucrose than without such treatment. Sucrose levels after application of chicken compost between KCl 50 kg/ha, 100 kg/ha and 150 kg/ha were not significantly different. If it is not treated with chicken compost, sweet corn stored at room temperature, there is a decrease in sucrose levels by 0.09% at 73 DAP and a reduction by 0.19% at 75 DAP, while after the application of chicken compost, the decrease is 0.06% at 73 DAP and 0.12% at 75 DAP. This confirms that the addition of chicken compost can maintain sweet corn sucrose levels up to 75 DAP.

The higher the dose of KCL fertilizer, the greater the sucrose content is (Table 5). This was validated by Jifon & Lester (2009), who found that fruit sugar content of muskmelon, a key consumer preference trait, responded positively to foliar K applications. Sweet corn sucrose levels rising in this experiment were caused by the role of K content in KCl fertilizer. Sweet corn still respires after harvesting, with sweet corn quality during storage observed both physically and chemically. Decreased levels of sugar characterize biochemical degradation as a result of a sustained respiratory process (Fagundes, Carciofi, & Monteiro, 2013). With the treatment of chicken compost 15 t/ha and KCl 150 kg/ha, sucrose content decreased from 13.93^{0}Brix (70 DAP) to 12.73^{0}Brix (73 DAP) and until 12.50^{0}Brix (75 DAP) (Table 5). This is supported by Jifon & Lester (2009) that K influences shrinkage of fruit weight. According to Hu et al. (2015), K is involved in the process of forming, breaking, and translocating sugar and starch. With this, K acts as a catalyst during photosynthesis, of which the end product is carbohydrates. Zörb, Senbayram, & Peiter (2014) confirmed that balanced fertilization, including K, is important for achieving a high-quality product. K also stimulates sucrose synthase, so K even impacts the taste of sweet corn kernels. From this research, it is clear that the quality of sweet corn is very easily compromised and could be lost in a single day if it is not handled properly.

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Table 5. Effect of application of chicken compost and KCl fertilizer on soluble solid and soluble solid loss

Doses of chicken compost (t/ha)	Doses of KCl fertilizer (kg/ha)	Soluble solid at 70 DAP (°Brix)	Soluble solid at 73 DAP (°Brix)	Soluble solid at 75 DAP (°Brix)	Soluble soil loss between 70 and 73 DAP (%)	Soluble solid loss between 70 and 75 DAP (%)
0	0	9.97 d	9.57 c	8.70 b	0.04	0.13
	50	10.83 c	9.70 bc	8.87 b	0.10	0.18
	100	12.40 b	10.63 bc	9.47 b	0.14	0.24
	150	12.53 b	11.37 ab	9.87 b	0.09	0.21
15	0	10.83 c	10.37 bc	9.30 b	0.04	0.14
	50	13.50 a	12.47 a	11.70 a	0.06	0.13
	100	13.63 a	12.70 a	12.00 a	0.07	0.12
	150	13.93 a	12.73 a	12.50 a	0.09	0.10
LSD 5%	ns	0.85	1.02	0.99	ns	ns

Remarks: A number followed by the same letter is not significantly different based on the LSD test at the 5 % level; ns = Not significantly different at the 5% level

Table 6 shows there is no interaction effect between the application of KCl fertilizer and chicken compost fertilizer on soil respiration at 0, 15, 30, 45, 60, and 70 DAP. The levels of soil respiration at 0, 15, 30, 45 and 60 DAP with that do not include chicken compost were significantly lower than the addition of chicken compost, except at 70 DAP. The highest soil respiration, owing to the addition of chicken compost, was achieved at 30 DAP at 167.03 mg/h/m^2. Application of KCl fertilizer in various doses did not increase soil respiration, but soil respiration was highest at 30 and 45 DAP based on the addition of KCl 150 kg/ha, i.e., 162.49 mg/h/m^2.

The results showed that the application of chicken compost significantly affected soil respiration and soil microbial populations of fungi and bacteria. The application of KCl fertilizer in various doses did not significantly elevate soil respiration and soil microbial populations. This is because KCl fertilizer generally applied for only works in improving soil chemical fertility. Chicken compost applied, providing organic compounds that can be used by microorganisms as a source of energy and substrate, was more effective than without. The results of Borowik & Wyszkowska (2016) and Šimon & Czakó (2014) showed that the characteristics of the land such that it has higher organic and moisture content is a favorable condition for optimal microbial growth. This confirms that organic matter plays a very important role in microorganisms' growth. The decomposition of chicken compost may release nutrients into the soil, so the availability of nutrients will be utilized by soil microorganisms (Jannoura, Joergensen, & Bruns, 2014) and cause the rate of soil microorganism activity to rise. The use of manure in higher doses increases the available C-organic levels for soil microorganisms, followed by elevated rates of soil respiration. The C-organic content impacts the activity and total population of microorganisms, resulting in greater CO_2 production. Higher soil CO_2 leads to the more pronounced activity of microorganisms, reflected by a higher rate of soil respiration, as well (Araújo, Leite, Santos, & Carneiro, 2009; Šimon & Czakó, 2014).

Respiration of soil at 70 DAP was notably diminished (Table 6). This is because the energy source for soil microbes has been exhausted, so microbial activity also declines. During the decomposition process, there will be a reduction in the C/N ratio of organic matter, and this is based on the decomposition process, causing the C/N ratio to become lower such that organic material decomposition continues during the plant growth process (Xu, Zhang, & Xu, 2019). Sharma & Banik (2014) have posited that C-organic is the basic energy source of soil microbes. The decrease of C/N values indicates that the C-organic content is depleted because it is used as a microbe substrate.

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Table 6. Effect of chicken compost and KCl fertilizer on soil respiration

Treatment	Soil respiration (mg/h/m^2)					
	0 DAP	15 DAP	30 DAP	45 DAP	60 DAP	70 DAP
Doses of chicken compost						
0 t/ha	44.85 b	61.74 b	112.44 b	122.84 b	119.59 b	109.84
15 t/ha	94.89 a	131.94 a	167.03 a	157.29 a	161.19 a	157.29
LSD 5%	14.14	13.14	22.61	63.24	36.67	ns
Doses of KCl fertilizer						
0 kg/ha	46.80	57.19	102.69	102.69	109.19	107.89
50 kg/ha	63.69	90.99	131.29	135.19	137.79	123.49
100 kg/ha	83.19	127.39	162.49	159.89	154.69	148.19
150 kg/ha	85.79	111.79	162.49	162.49	159.89	154.69
LSD 5%	ns	ns	ns	ns	ns	ns

Remarks: A number followed by the same letter is not significantly different based on the LSD test at the 5 % level; ns = Not significantly different at the 5% level

Table 7. Effect of chicken compost and KCl fertilizers on microbial populations

Treatment	Total population of fungi (10^{-6} cfu/ml)			Total population of bacteria (10^{-8} cfu/ml)		
	0 DAP	30 DAP	70 DAP	0 DAP	30 DAP	70 DAP
Doses of chicken compost						
0 t/ha	18.50 b	19.50 b	27.69 b	13.61 b	21.67 b	25.71 b
15 t/ha	30.37 a	35.07 a	40.74 a	32.05 a	53.60 a	53.49 a
LSD 5 %	3.89	4.50	5.02	10.96	5.43	8.05
Doses of KCl fertilizer						
0 kg/ha	19.71	20.79	25.23	20.61	30.55	34.07
50 kg/ha	21.11	25.37	32.35	22.18	35.11	37.73
100 kg/ha	26.43	28.51	35.27	23.45	41.48	43.04
150 kg/ha	30.49	34.45	44.01	25.08	43.41	43.55
LSD 5 %	ns	ns	ns	ns	ns	ns

Remarks: A number followed by the same letter is not significantly different based on the LSD test at the 5 % level, ns = Not significantly different at the 5% level

Table 7 shows there are no interaction effects of chicken compost and KCl fertilizer on microbial populations at 0, 30, and 70 DAP. Soil fungi and bacteria populations at 0, 30, and 70 DAP with treatment via chicken compost are significantly higher than without. The highest number of fungi populations based on the addition of chicken compost was achieved at 70 DAP, i.e., 40.74 x 10^{-6} cfu/ml and the highest bacterial population was reached at 30 DAP at 53.60 x 10^{-8} cfu/ml. The application of KCl fertilizers in various doses did not elevate the population of fungi or soil bacteria. At 70 DAP, the greatest number of soil fungi and bacteria was obtained through the application of KCl 150 kg/ha fertilizer, which was 44.01 x 10^{-6} cfu/ml and 43.55 x 10^{-8} cfu/ml, respectively.

With increased soil respiration, the number of microbial populations in soil, such as fungi and bacteria, increases as well (Table 7) as chicken compost also contains microorganisms that can raise the total number of microorganisms in the soil. Therefore, the use of chicken compost could elevate the total population of microorganisms in the soil. This is in accordance with Liu et al. (2010) and Šimon & Czakó (2014) that microbial biomass was considerably greater in soils receiving farmyard

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compost. Murmu, Swain, & Ghosh (2013) also established that organic manure increases soil health compared to chemical fertilizer.

CONCLUSION

Application of chicken compost increased plant height and leaf number, while leaf index became wider and SPAD, chlorophyll content, β-carotene, production, soil respiration, and soil microbial populations rose; storability of sweet corn was maintained longer, exhibited through low weight loss and a high degree of sweetness. The application of KCl fertilizer increased the production and quality of postharvest sweet corn but did not elevate soil respiration. The benefits of chicken compost can reduce the use of KCl fertilizer by 25 %. Soil health, as indicated by soil respiration and soil microbial population, was better when chicken compost was applied. The application of chicken compost 15 t/ha combined with inorganic fertilizers KCl is recommended for sweet corn cultivation in Ultisol soil.

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