Comparative efficacy of KCl blended composts and sole application of KCl or K$_2$SO$_4$ in improving K nutrition, photosynthetic capacity and growth of maize

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Abstract

Under arid and semiarid climate conditions, application of muriate of potash (KCl) results in salinity problem due to its higher chloride (Cl$^-$) contents. In order to combat this problem, KCl was blended with different sources of compost (fruits and vegetables, poultry, press mud and cow dung) in order to get a dilution effect of composts. A pot experiment was conducted to evaluate the comparative efficacy of KCl blended composts and KCl or K$_2$SO$_4$ alone on growth, physiology and K nutrition of maize. Different composts applied @ 500 kg ha$^{-1}$ were blended with KCl in such a way that each combination received the same amount of K as in case of recommended KCl and K$_2$SO$_4$ alone. Muriate of potash blended poultry compost significantly improved various growth parameters like plant height (19%), root length (60%), root (100%) and shoot fresh weight (64%), root (88%) and shoot dry weight (81%) and chlorophyll contents (29%) compared to KCl alone. However, the maximum physiological parameters were observed with KCl blended press mud compost. Similarly, KCl blended poultry compost significantly increased K concentration and uptake in shoot (26 and 122%) and root (39 and 133%) compared to KCl alone. Post-harvest soil analysis showed an increase of about 2 folds in K contents in KCl blended poultry compost compared to KCl alone. Based on the above results, KCl blended composts proved better in improving various growth, physiological and K nutrition of maize compared to the application of KCl and K$_2$SO$_4$ alone.

Keywords: Compost, muriate of potash, chloride contents, potassium sulfate, K nutrition

Introduction

In existing cropping system of Pakistan, maize (Zea mays L.) occupies third place after wheat and rice according to area under cultivation. It is mainly cultivated in Khyber Pukhtunkhwa (KP) and Punjab provinces during two seasons (spring and autumn). Potassium (K) demand in maize is particularly high during rapid growth and may reach up to about 8 kg ha$^{-1}$ K$_2$O day$^{-1}$ (Engels, 1993). Soils of Pakistan are usually deficient in N and P but during the last decade, it has also been reported that about 25% of the arable soils and 75% of paddy soils are K deficient (Akhhtar et al., 2003). Potassium deficiency may lead to reduction in number and size of leaves which ultimately lead to less photosynthetic rate per unit area, hence low yield of crops (Rengel and Damon, 2008; William, 2008). It plays a key role in energy metabolism, protein synthesis, and solute transport, cell turgor in rapidly expanding cells and acts as a counter cation for anion accumulation (Cakmak, 2005).

Use of organic amendments has been found to be effective in reducing the hazardous effects of Cl$^-$ on crop plants (Zakir et al., 1997). Organic fertilizers have long been known for improving growth and yield of crops through the provision of macro- as well as micro-nutrients (Chamani et al., 2008). Similarly, application of organic fertilizers improved leaf water and osmotic potential to ameliorate the negative effects of sea water salts by enhancing the availability of some cations like K$^+$ and phytohormones (Marshall and Porter, 1991). However, their sole application to feed increasing population is not possible due to low and slower supply of nutrients to support modern intensive agriculture. Recently, interest has been renewed in integrating the use of organic and inorganic fertilizers. Application of organic fertilizers have been found to improve organic matter contents of the soil and soil structure by improving microbial activity (Ros et al., 2006) ultimately improving the availability of nutrients to the crop plants. However, few studies have reported the

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efficacy of applying organic fertilizers to decrease the negative impact of salt stress (Zakir et al., 1997; Abou El-Magd et al., 2008). Similar is the case with mechanisms lying behind this amelioration. During composting, certain plant growth promoting materials (auxin, amino acids and vitamins) are produced, attracting beneficial microbes which suppress soil borne diseases and holds its nutrients in organic or slow release form (Chamani et al., 2008).

Various potassic fertilizers (K$_2$SO$_4$, KCl, KH$_2$PO$_4$ and KNO$_3$) are being used and their selection is based on their availability, price, ease of use and solubility (Elam et al., 1995). Sulfate of potash (K$_2$SO$_4$) is a preferable source of K as it has low salt index and improves plant’s potential to disease resistance. Moreover, sulfur becomes available as an additional nutrient which has a critical role in nitrogen metabolism and crucial for oilseed crops. K$_2$SO$_4$ is preferably used for salt and chloride sensitive crops (Marschner, 1995). However, KCl is an economical source of K with 60-63% K$_2$O and has high solubility at 20 °C (13% dissolves in 8 minutes) compared to K$_2$SO$_4$ which has only 4% dissolution in 25 minutes (Elam et al., 1995). Moreover, peasant farmers cannot afford the use of high cost inorganic K fertilizers. So, there is dire need to find out some strategies in order to combat the problems associated with the use of KCl and making it an economical source of K for crop plants. The major concern with the use of KCl is that it contains about 45-47% chloride (Cl$^-$) content which ultimately increases the pH and cause salinity problem when applied to alkaline soils. For normal plant growth and physiological functions, Cl$^-$ is a complementary anion and an undesirable but unavoidable micronutrient (Fixen et al., 1986). Chloride (Cl$^-$) is required in photosystem II during oxidation state to split water molecules.

Application of organic fertilizers indirectly helps to ameliorate the salt stress in plants. No direct mechanism has been reported. With the application of organic fertilizers, growth and yield of various crops like Brassica oleracea and Spinacia oleracea (El-Missery, 2003), Allium cepa (Saleh et al., 2003) and Foeniculum vulgare (Abou El-Magd et al., 2008) was significantly improved even under saline water irrigation. Moreover, Na$^+$ contents in the vegetative parts of sweet fennel fertilized with organic manure were significantly reduced compared to the control and K$^+$ contents were increased under saline conditions (Abou El-Magd et al., 2008). Similarly, application of organic fertilizers improved leaf water and osmotic potential to ameliorate the negative effects of sea water salts by enhancing the availability of some cations like K$^+$ and phytohormones (Marshall and Porter, 1991).

In order to use an economical source with higher contents of K under arid and semiarid climate conditions, one strategy could be to have a dilution effect of KCl via the application of organic fertilizers. It would not only help improve physiochemical and biological properties of soil but also result in less use of KCl and ultimately less buildup of salts via Cl$^-$ contents. Based on these hypotheses, a pot experiment was conducted to evaluate the comparative efficacy of the application of KCl blended compost vs. KCl alone and KCl blended compost vs. K$_2$SO$_4$ alone using maize as a test crop.

**Materials and Methods**

A pot experiment was conducted to evaluate the effects of KCl blended different sources of compost in greenhouse of the Institute of Soil and Environmental Sciences, University of Agriculture, Faisalabad (UAF), Pakistan. Maize variety Hy-corn 786 was used. Before the start of experiment, bulk surface soil (0-15 cm) sample was collected and pre-sowing analyses for physicochemical properties were performed using standard methods (US Salinity Laboratory Staff, 1954). The physicochemical properties of soil used for filling of pots were found to be as: texture, sandy clay loam; organic matter, 0.76%; EC, 1.45 dS m$^{-1}$; pH, 7.52; available K, 66 mg kg$^{-1}$ and CEC, 11 cmol, kg$^{-1}$. To each pot, 8 kg soil (2 mm) was transferred and pots were arranged according to the completely randomized design (CRD) in triplicate. Six healthy seeds of maize were sown per pot and after the plant establishment only three plants were maintained in each pot by uprooting rest of them.

The compost was prepared following the method as described by Ditta et al. (2015) with some modifications. Briefly, the composting materials consisting of fruit peels and vegetable wastes were collected from the local market. The poultry waste, press mud and cow dung were collected from poultry farm, sugar mill (Chaudhary Sugar Mills, Faisalabad) and nearby farm house, respectively. The collected materials were oven dried (70°C) for 24 h and ground to fine powder (< 2.0 mm) with the help of electric grinder. The crushed materials were subjected to composting process. After 7 days, recommended rates of KCl were individually blended with compost in 50:50 ratio by mass.

There were six treatments in all viz. $T_1 = $ KCl alone (@ 125 kg K$_2$O ha$^{-1}$), $T_2 = $ K$_2$SO$_4$ alone (@ 125 kg K$_2$O ha$^{-1}$), $T_3 = $ KCl blended fruits and vegetables compost, $T_4 = $ KCl blended poultry compost, $T_5 = $ KCl blended press mud compost and $T_6 = $ KCl blended cow dung compost. In each treatment, compost was applied @ 500 kg ha$^{-1}$. Compost was analyzed for NPK and remaining doses of recommended NPK (62.5, 87.5 and 80 mg kg$^{-1}$ soil,
respectively) were mixed with respective composts using chemical fertilizers viz. urea, diammonium phosphate and KCl, respectively. The physicochemical properties of the composts used are tabulated in Table 1. Tap water was used to maintain optimum moisture for plant growth throughout the experimental period. Irrigation was based on plant and soil conditions.

Before harvesting the crop, plant height was measured using meter rod. After harvesting, fresh and dry weights of shoot and root were recorded using measuring balance. Both shoot and root samples were thoroughly washed with distilled water and then blot dried with tissue paper before sun drying. Sun dried plant samples were placed in oven at 72 °C for 72 h until constant weight was achieved. The soil from each pot was washed to collect root samples.

Physiological parameters of maize plants under different treatments were recorded at midday (between 10:00 and 14:00) using fully expanded flag leaves. Portable infra-red gas analyzer [IRGA (LCA-4) Germany] was used (at 1,200–1,400 µmol m⁻² s⁻¹ photosynthetic photon flux density) to measure photosynthetic rate (A), transpiration rate (E), stomatal conductance (gs), and sub-stomatal CO₂ density) to measure photosynthetic rate (A), transpiration rate (E), stomatal conductance (gs), and sub-stomatal CO₂

### Table 1: The chemical analysis of different sources of compost

| Parameter       | Fruit and vegetable compost | Poultry compost | Press mud compost | Cow dung compost |
|-----------------|------------------------------|----------------|-------------------|-----------------|
| pH              | 5.73±0.09                    | 6.50±0.06      | 6.77±0.09         | 7.83±0.03       |
| EC (dS m⁻¹)     | 3.18±0.03                    | 3.97±0.02      | 4.7±0.05          | 4.3±0.03        |
| Carbon (%)      | 19.73±0.05                   | 16.98±0.17     | 28.94±0.32        | 26.24±0.79      |
| Nitrogen (%)    | 2.13±0.06                    | 6.22±0.06      | 1.76±0.06         | 1.73±0.06       |
| Phosphorus (%)  | 0.42±0.06                    | 2.78±0.11      | 1.78±0.09         | 0.99±0.11       |
| Total K (%)     | 1.00±0.02                    | 1.9±0.03       | 1.1±0.01          | 0.70±0.02       |
| C:N             | 9.26±0.23                    | 2.73±0.07      | 16.44±0.36        | 15.20±0.92      |
| C:P             | 49.56±7.65                   | 6.11±0.19      | 16.34±0.83        | 27.13±2.51      |
| C:K             | 19.73±1.03                   | 8.93±0.66      | 26.33±1.70        | 37.48±1.31      |
| Chloride (%)    | 0.08±0.01                    | 0.17±0.03      | 0.09±0.01         | 0.69±0.02       |

### Table 2: Effect of KCl blended with different sources of compost on growth parameters of maize

| Treatment | Plant Height (cm) | Root Length (cm) | Shoot Fresh Weight (g) | Root Fresh Weight (g) | Shoot Dry Weight (g) | Root Dry Weight (g) |
|-----------|-------------------|------------------|------------------------|-----------------------|----------------------|---------------------|
| T₁        | 36(0)             | 9.4(0)           | 44(0)                  | 4(0)                  | 21(0)                | 1.6(0)              |
| T₂        | 37(3)             | 9.3(−1)          | 44(0)                  | 4(0)                  | 22(5)                | 1.6(0)              |
| T₃        | 40(11)            | 13.0(38)         | 63(43)                 | 7(75)                 | 31(48)               | 2.0(25)             |
| T₄        | 43(19)            | 15.0(60)         | 72(64)                 | 7(100)                | 38(81)               | 3.0(88)             |
| T₅        | 41(14)            | 12.0(28)         | 50(14)                 | 6(50)                 | 27(29)               | 1.7(6)              |
| T₆        | 39(8)             | 13.8(38)         | 55(20)                 | 7(75)                 | 26(24)               | 2.0(25)             |

Note: T₁=MOP (muriate of potash); T₂=SOP (sulfate of potash); T₃=KCl blended with fruit and vegetable compost; T₄=KCl blended with poultry compost; T₅=KCl blended with press mud; T₆=KCl blended with cow dung compost

### Table 3: Effect of KCl blended with different sources on physiological parameters of maize

| Treatment | Photosynthetic rate (µmol CO₂ m⁻² s⁻¹) | Transpiration rate (mmol H₂O m⁻² s⁻¹) | Stomatal conductance (mmol H₂O m⁻² s⁻¹) | Sub-stomatal conductance (mmol H₂O m⁻² s⁻¹) | Chlorophyll contents (mg g⁻¹ FW) |
|-----------|----------------------------------------|--------------------------------------|----------------------------------------|---------------------------------------------|----------------------------------|
| T₁        | 16(0)                                  | 9(0)                                 | 0.133(0)                               | 0.117(0)                                    | 17.0(0)                          |
| T₂        | 16(0)                                  | 11(22)                               | 0.161(21)                              | 0.157(34)                                   | 19.5(15)                         |
| T₃        | 20.8(30)                               | 13(18)                               | 0.172(29)                              | 0.166(42)                                   | 20.0(18)                         |
| T₄        | 20(25)                                 | 12(14)                               | 0.180(35)                              | 0.183(56)                                   | 22.0(29)                         |
| T₅        | 19(19)                                 | 16(78)                               | 0.201(51)                              | 0.195(67)                                   | 19.0(12)                         |
| T₆        | 21.2(32)                               | 11(22)                               | 0.180(35)                              | 0.165(41)                                   | 20.5(15)                         |

Note: T₁=MOP (muriate of potash); T₂=SOP (sulfate of potash); T₃=KCl blended with fruit and vegetable compost; T₄=KCl blended with poultry compost; T₅=KCl blended with press mud; T₆=KCl blended with cow dung compost

Values having same letters in a column are statistically non-significant with respect to each other (* = significant at p < 0.05).
concentration (Ci). SPAD-502 meter (Konica-Minolta, Japan) was used to measure chlorophyll contents. Readings were recorded with four repeats from each treatment.

The K contents in root and shoot samples were determined according to Jackson; (1962). Briefly, ammonium acetate solution (33 mL) was added in 5 g air-dried soil placed in a 50-mL centrifuge tube and was shaken for 5 minutes on a shaker until the supernatant was clear. Combined ammonium acetate extracts were diluted to 100 mL with 1 N ammonium acetate solution. A series of suitable potassium standards were run and a calibration curve was drawn. The emission readings of the samples (soil extracts) were taken on Flame Photometer (PPF-7, Jenway, UK) at 767-nm wavelength and potassium (K) concentrations were calculated according to the following formula:

\[
\text{Extractable K (ppm)} = \frac{\text{ppm K (from calibration curve) \times A}}{\text{Wt}}
\]

Where: A = Total volume of the extract (mL)  
Wt. = Weight of air-dry soil (g)

Potassium concentration and uptake in root and shoot was also calculated.

**Data analysis**

Data for different growth, physiological and yield attributes were collected and analyzed statistically using software “Statistix 8.1™” software package (Analytical Software, 2005) for analysis of variance (Steel et al., 1997). The treatment means were compared by using least significance difference (LSD) test at 5% probability level.

**Results**

Data regarding the effect of the application of KCl blended composts, KCl and \( \text{K}_2\text{SO}_4 \) alone on growth parameters of maize is presented in Table 2. It is clear from the data that KCl blended poultry compost caused the maximum increase in the various growth parameters like plant height, root length, shoot and root fresh and dry weight. The minimum values for growth parameters were noted in case of application of KCl alone followed by \( \text{K}_2\text{SO}_4 \) alone. All KCl blended composts showed significant improvement in growth parameters compared to KCl or \( \text{K}_2\text{SO}_4 \) alone. Among KCl blended composts, the minimum increase in root length, shoot fresh weight, root fresh weight and root dry weight was noted in case of KCl blended press mud compost, followed by KCl blended cow dung compost and KCl blended fruit and vegetable compost, respectively. However, for plant height and shoot dry weight, the minimum was resulted with the application of KCl blended cow dung followed by KCl blended press mud compost and KCl blended fruit and vegetable compost, respectively.

Physiological parameters like photosynthesis (CO$_2$ assimilation rate), transpiration rate, stomatal and sub-stomatal conductance and chlorophyll contents were significantly improved with the application of KCl blended composts compared to that with the application of KCl and \( \text{K}_2\text{SO}_4 \) alone (Table 3). The maximum transpiration rate, stomatal and sub-stomatal conductance was noted in case of KCl blended press mud compost. However, the CO$_2$ assimilation rate was maximum with the application of KCl blended cow dung compost while KCl blended poultry compost resulted in the maximum chlorophyll contents. The minimum values were recorded with the application of KCl alone.

Potassium concentration and uptake was measured in shoot and roots parts of maize and a significant improvement was noted with the application of KCl blended composts compared to KCl and \( \text{K}_2\text{SO}_4 \) alone (Table 4). The maximum increase in shoot and root K concentration and shoot K uptake was recorded with the application KCl blended poultry compost while K uptake in root was the maximum with the application of KCl blended fruit and vegetable compost. The minimum K concentration and uptake in root and shoot was noted with the application of KCl alone.

During post-harvest soil analysis, treatment effects on different chemical properties and nutrient status were determined (Table 5). In case of pH, the maximum reduction was noted with the application of KCl blended press mud followed by KCl blended cow dung compost. An increase in soil pH was noted with the application of KCl and \( \text{K}_2\text{SO}_4 \) alone compared with pre-soil analysis and other treatments. In case of Cl$^{-}$ contents, a decreasing trend was noted with the application of different KCl blended composts compared to KCl and \( \text{K}_2\text{SO}_4 \) alone. However, the maximum decrease was observed with the application of KCl blended press mud compost and \( \text{K}_2\text{SO}_4 \) alone. In case of CEC, K and organic matter contents, a significant increase was observed with the application of different KCl blended composts compared to KCl and \( \text{K}_2\text{SO}_4 \) alone. The maximum increase in CEC and organic matter was recorded with the application of KCl blended cow dung compost while K contents were maximum with the application of KCl blended poultry compost.

**Discussion**

The combined application of KCl blended composts showed comparatively better effect on various growth parameters of maize compared to the sole application of KCl and \( \text{K}_2\text{SO}_4 \). Earlier, it has been found that the
application of organic fertilizers improves organic matter in the soil (Nelson and Oades, 1998) which ultimately improves physicochemical and biological properties of the soil especially soil structure as better soil structure ensures improved water holding capacity and ultimately improved availability of nutrients to the crop plants (Chamani et al., 2008). So, instead of providing equal amount of nutrients in all the treatments, the improvement with the application of KCl blended composts might be due to the above-mentioned fact which resulted in improvement in growth parameters. This premise has also been supported by the fact that physiological parameters were significantly improved with the application of KCl blended composts compared to the sole application of KCl and K₂SO₄. The reason might be due to an increased supply of nutrients to the crop plants with the improvement in soil structure caused by the application of different composts. Moreover, during composting, organic acids e.g. humic and fulvic acids are released (De Bertoldi et al., 1996). So, when a composted material is applied to the soil, it might result in decreasing the pH of microclimate and resulted in better supply of macro-and micro-nutrients like P, Fe, Mn, Zn, Cu and B which otherwise are less available at high pH (Marschner, 1995). Increase in physiological parameters was observed in pots treated with different levels of cow dung and poultry compost as compared to control which was suggested to be due to the improved supply of nutrients to the crop plants (Chamani et al., 2008).

Higher K uptake in shoot and root resulted in improved concentration of K in shoot and root with the application of KCl blended poultry compost compared to alone application of KCl which might be due to improved soil conditions through organic fertilizer. Earlier, an improvement in soil and leaf N, P, K, Ca and Mg

### Table 4: Effect of KCl blended with different sources of compost on chemical parameters of maize

| Treatment | Potassium in shoot (%) | Potassium in root (%) | Potassium uptake in shoot (mg pot⁻¹) | Potassium uptake in root (mg pot⁻¹) |
|-----------|------------------------|-----------------------|-------------------------------------|-------------------------------------|
| T₁        | 1.70⁶ (0)              | 0.86⁶ (0)             | 0.37⁶ (0)                           | 0.015⁶ (0)                          |
| T₂        | 1.96 ⁵ (15)            | 0.98⁴ (14)            | 0.38⁴ (1)                           | 0.015⁴ (0)                          |
| T₃        | 1.99⁵ (17)             | 1.10⁴ (28)            | 0.66⁴ (78)                          | 0.040⁴ (167)                        |
| T₄        | 2.15⁺ (26)             | 1.20⁺ (39)            | 0.82⁺ (122)                         | 0.035⁺ (133)                        |
| T₅        | 1.99⁺ (17)             | 0.99⁺ (15)            | 0.55⁺ (49)                          | 0.032⁺ (113)                        |
| T₆        | 1.92⁺ (13)             | 1.00⁺ (16)            | 0.49⁺ (32)                          | 0.031⁺ (107)                        |

Note: T₁=MOP (muriate of potash); T₂=SOP (sulfate of potash); T₃=KCl blended with fruit and vegetable compost; T₄=KCl blended with poultry compost; T₅=KCl blended with press mud; T₆=KCl blended with cow dung compost

(*) = % increase from the control

Values having same letters in a column are statistically non-significant with respect to each other (* = significant at p < 0.05).

### Table 5: Effect of KCl blended with different sources of compost on physicochemical parameters of soil recorded after the crop harvest

| Treatment | pH     | EC (dS m⁻¹) | CEC (cmol, kg⁻¹) | K (mg kg⁻¹) | Cl⁻ (mmol, L⁻¹) | Organic matter (%) |
|-----------|--------|-------------|------------------|-------------|-----------------|--------------------|
| T₁        | 7.9⁺ (0) | 3.0⁺ (0)    | 11.9 (0)         | 102⁺ (0)    | 8.7⁺ (0)        | 0.71⁺ (0)          |
| T₂        | 7.6⁺ (4) | 3.0⁺ (0)    | 11.7⁺ (2)        | 92⁺ (10)    | 4.5⁺ (48)       | 0.7₂⁺ (1)          |
| T₃        | 7.5⁺ (5) | 2.0⁺ (-33)  | 14.0⁺ (18)       | 107⁺ (5)    | 5.0⁺ (-42)      | 0.9₁⁺ (28)         |
| T₄        | 7.4⁺ (6) | 3.0⁺ (0)    | 15.0⁺ (26)       | 120⁺ (18)   | 5.5⁺ (-37)      | 0.9₅⁺ (34)         |
| T₅        | 7.2⁺ (9) | 5.0⁺ (67)   | 14.5⁺ (22)       | 114⁺ (12)   | 4.5⁺ (-48)      | 0.9₀⁺ (27)         |
| T₆        | 7.3⁺ (9) | 3.0⁺ (0)    | 16.0⁺ (34)       | 104⁺ (2)    | 6.0⁺ (-31)      | 1.0₀⁺ (41)         |

Note: T₁=MOP (muriate of potash); T₂=SOP (sulfate of potash); T₃=KCl blended with fruit and vegetable compost; T₄=KCl blended with poultry compost; T₅=KCl blended with press mud; T₆=KCl blended with cow dung compost

(*) = % increase from the control

(-) = % decrease from the control

Values having same letters in a column are statistically non-significant with respect to each other (* = significant at p < 0.05).
Post-harvest soil analysis showed a significant improvement in various soil properties in the pots treated with different KCl blended composts compared to alone application of KCl and K₂SO₄ with respect to nutrient availability which ultimately resulted in improved growth and physiological parameters of maize. For example, pH, EC and Cl⁻ contents were decreased in the pots treated with KCl blended composts which resulted in improved availability of nutrients to the crop plants and ultimately improvement in growth and physiological parameters was recorded (Table 2, 3). However, this decrease was not prominent in the pots treated with KCl or K₂SO₄ alone. The decrease in pH might be due to the production of organic acids (amino acid, glycine, cystein and humic acid) during mineralization (amminization and ammonification) of organic materials by heterotrophs and nitrification by autotrophs (Walker et al., 2003). Moreover, production of NH₄⁺ and CO₂ during composting have also been shown to reduce soil pH and EC (Albanell et al., 1988). Earlier, it was suggested that application of press mud compost decreased pH due to the removal of salts (Muhammad and Khattak, 2009). Moreover, decrease in Cl⁻ contents might be due to dilution effect of different composts application as less KCl was required to fulfill the requirement of the crop due to the presence of micro- and macro-nutrients.

In case of CEC, K and organic matter contents, improvement was noted in the pots treated with different KCl blended composts compared to alone application of KCl and K₂SO₄. This might be due to the addition of compost; the carbon contents of the soil were improved which ultimately resulted in increased organic matter content (Mucheru-Muna et al., 2007) and CEC of the soil. Earlier, an increase in soil organic matter and exchangeable cations was recorded with the application of poultry compost (Agbede et al., 2008).

Application of KCl blended poultry compost increased K contents in soil which might be due to its high organic matter contents which bind K in exchangeable and available form and prevent it from leaching. Earlier, it has been found that decomposition of organic matter increases nutrient contents (N, P, K, Ca and Mg) of the soil (Agbede et al., 2008; Chamani et al., 2008).

Conclusion

Application of KCl blended poultry compost could serve a better source of K compared to the application of KCl and K₂SO₄ alone as is clear from improvement in growth and physiological parameters of maize. However, further evaluation under field conditions are needed to achieve maximum yield potential of maize crop by integrating organic and inorganic fertilizers.

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