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EFFECT OF FLY ASH AND MICRONUTRIENTS (ZN AND FE) ON YIELD OF MAIZE CROP

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Abstract

A field experiment was conducted at the main Field Station, Department of Agriculture, Lovely Professional University, Phagwara, Punjab during session 2018-2019 on sandy loam soil with ph 7.41 and Ec 0.35(ds m^{-1}). The study was done to evaluate the "Effect of Fly ash and micronutrients (Zn and Fe) on yield of maize crop." Pioneer 3401 hybrid variety was used. The experiment has seven treatments T_1 (RDF), T_2 (Fly ash 10 t ha^{-1}), T_3 (RDF + Zn EDTA 12%), T_4 (RDF + Fe EDTA 12%), T_5 (RDF + Fly ash 10 t ha^{-1}+ Zn EDTA 12%), T_6 (RDF + Fly ash 10 t ha^{-1}+ Fe EDTA 12%) and T_7 (RDF + Fly ash 10 t ha^{-1} + Zn EDTA 12% + Fe EDTA 12%) and was arranged in RBD design. The different parameters of growth and yield was evaluated. It was reported that T_7 shows the maximum records of Number of cobs per plant (1.73), cob length (18.17 cm), cob weight (141.57 g), grains per cob (339.86), cob girth (14.03 cm), grain rows per cob (13.26), 100 seed weight (26 g) and seed yield (70.27q/ha). The least was recorded from T_1 treatment. The yield of a crop has shown more responses to the combine application of RDF, Fly ash and foliar spray of Zn and Fe. The combination of fertilizers has an anticipated command on maize cultivar.

Key words : Fly ash, Maize cultivar, Micronutrients, Foliar spray.

Introduction

Maize (*Zea mays* L.) is one of the most important grain crops after rice and wheat overall. Maize is an annual plant which belongs to the family Poaceae and *Zea* as Genus. *Zea mays* L. has 10 pairs of chromosomes. Maize is the very essential crop for fodder and grains in rainfed and irrigated systems of agriculture in regions of arid and semi arid. United states of America, Brazil, China, India and Mexico are major countries which contribute in maize production. It is popularly grown in Punjab, Karnataka, Andhra Pradesh, Tamil Nadu, Rajasthan, Maharashtra, Bihar, Uttar Pradesh, Madhya Pradesh and Gujarat account for 85 per cent of India's maize production and 80 per cent of area under cultivation. In Punjab, it is mostly sown in the districts of Hoshiarpur, Ropar, Shaheed Bhagat Singh Nagar, Amritsar, Gurdaspur, Jalandhar, Kapurthala, Patiala, Ludhiana, SAS Nagar and Fatehgarh Sahib. It is the very essential crop among the cereals in the agricultural economy, in food and fodder crop. Maize is increasing popularity between the farmers of India because it adapt and survive in all agro-climatic zones of india, the quality to grow in all seasons makes popular. Due to its high yielding and all other qualities it is also called as "Queen of Cereals" Maize occupied an important place as food for human (25%), poultry feed (52%), animal food (11%), starch (10%) and brewery (2%). Maize is also cheap source of home heating furnaces have been developed which uses maize kernels or wood pellets or cherry pits as a fuel. They feature a large hopper that feeds the uniformly sized maize kernels into fire. Maize is also used for gaining feed stock for the production of ethanol fuel. Ethanol is mixed with gasoline to decrease the amount of pollutants emitted when used to fuel in the motor vehicles. In India, maize contributes about 9% for the basket of national food and about Rs.100 billion to the GDP of agriculture and it also create employment for the more than 100 million man days at the farms and in industrial and agricultural sector. (Mahajhan V, 2016). In the recent time of progressive or sustainable agriculture farmers creates a big interest in the use of fly ash in agricultural

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fields for gaining a crop production, soil health and regenerating wastelands (Pathan *et al.,* 2003).

The objectives of the research is described below

1. To correlate different micronutrient combinations with yield
2. To study the effect of different amendments on growth and yield
3. To evaluate the impact of fly ash and find out best treatment

Materials and Methods

The present investigation was carried out at the departmental farms of Lovely Professional University, Punjab. The experimental site is located at a latitude of 31.24° and longitude of 75.70° as map coordinates along with altitude of 232 m above sea level. The soil experimental field was sandy loam in texture, well fertile and free from weeds. Initial nutrient evaluation of soil revealed medium level of organic carbon, available nitrogen and available P and K. The experiment was divided in to seven treatments replicated thrice and laid out in a Randomized Block design. Maize variety P- 3401 was used at a recommended seed rate of 20 kg/ha. Treatments comprised of T_1 (RDF), T_2 (Fly ash 10 t ha^{-1}), T_3 (RDF + Zn EDTA 12%), T_4 (RDF + Fe EDTA 12%), T_5 (RDF + Fly ash 10 t ha^{-1}+ Zn EDTA 12%), T_6 (RDF + Fly ash 10 t ha^{-1}+ Fe EDTA 12%) and T_7(RDF + Fly ash 10 t ha^{-1} + Zn EDTA 12% + Fe EDTA 12%). Seed rate, fertilizer doze and cultural practices followed were as per the recommended package of practices for maize (Anonymous, 2013). Observations were recorded on plant growth, seed yield and nutrient uptake by plant.

Statistical analysis

The treatments were subjected to statistical analysis using SPSS v.21 software and Duncan Multiple Range Test was applied to derive the homogenous sets.

Results and Discussion

Yield parameters

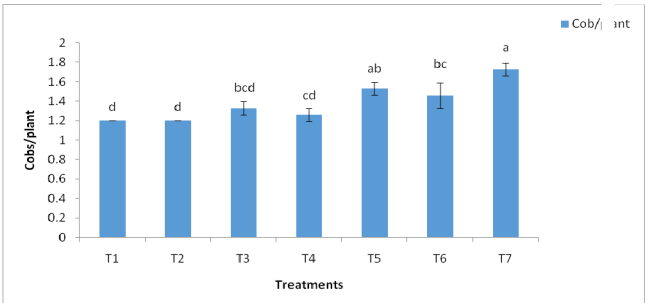
Data pertaining to No. of Cobs of maize under effect of flyash and micronutrients is expressed in Tables of yield parameters. From the perusal of the data, it is evident that maximum no. of cobs (1.73) was recorded with the application of RDF + fly ash + Zn + Fe (T_7) whereas no. of cobs (1.20) was recorded under control. Maximum cob length (18.17cm) were recorded under the treatment T_7 whereas minimum cob length (15.16cm) was recorded under control. Both number of cobs and cob length were recorded maximum where RDF + fly ash + Zn + Fe was applied. Qadir *et al.,* (2013) resulted highest result with combination of three micronutrients. Mahmoud *et al.,* (2006) also reported that micronutrients when applied in foliar spray show maximum results. Zn

Effect of fly ash and micro nutrient on the no. of cobs plant^{-1}, cob length and Grains cob^{-1} of maize

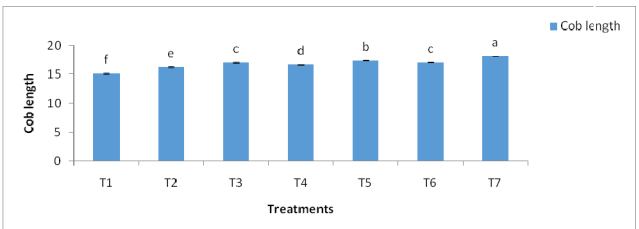
Treatments	Cobs plant^{-1}	Cob length	Grains cob^{-1}
T_1	1.20^{d}±0.00	15.16^{f}±0.120	304.93^{e}±1.50
T_2	1.20^{d}±0.00	16.30^{e}±0.100	316.86^{d}±4.48
T_3	1.33^{bcd}±0.067	17.03^{c}±0.088	325.53^{c}±1.41
T_4	1.26^{cd}±0.067	16.70^{d}±0.058	319.20^{d}±1.11
T_5	1.53^{ab}±0.067	17.46^{b}±0.033	333.53^{b}±0.43
T_6	1.46^{bc} ±0.133	17.07^{c}±0.065	326.40^{c}±1.24
T_7	1.73^{a}±0.067	18.17^{a}±0.036	339.86^{a}±0.835
CD	0.231	0.250	5.9
S.E(M)	0.074	0.080	1.9

Effect of fly ash and micro nutrient on Cob girth, test weight and seed yield of maize

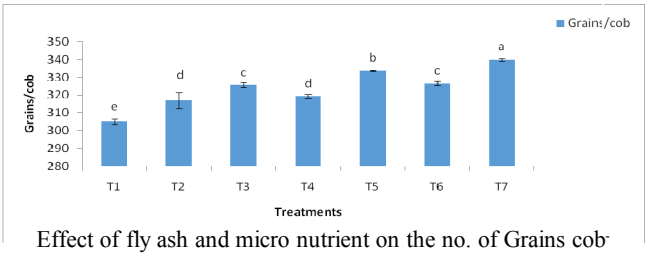
Treatments	Cob girth	Test weight (100 seeds)	Seed yield (q ha^{-1})
T_1	12.23^{g}±0.023	23.02^{f}±0.078	65.78^{g}±0.027
T_2	12.46^{f}±0.012	23.56^{e}±0.070	66.57^{f}±0.026
T_3	12.92^{d}±0.034	24.40^{cd}±0.239	68.16^{d}±0.044
T_4	12.71^{e}±0.013	24.12^{d}±0.064	67.73^{e}±0.32
T_5	13.78^{b}±0.007	25.32^{b}±0.130	69.55^{b}±0.133
T_6	13.49^{c}±0.015	24.73^{c}±0.033	68.63^{c}±0.216
T_7	14.03^{a}±0.035	26.00^{a}±0.058	70.27^{a}±0.087
CD	0.071	0.31	0.252
S.E(M)	0.02	0.10	0.081



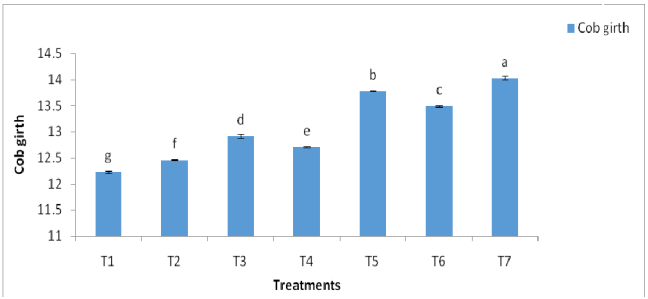
Effect of fly ash and micro nutrient on the no. of cobs plant^{-1}



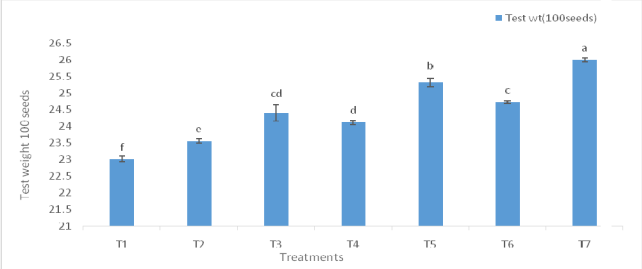
Effect of fly ash and micro nutrient on the cob length (cm)



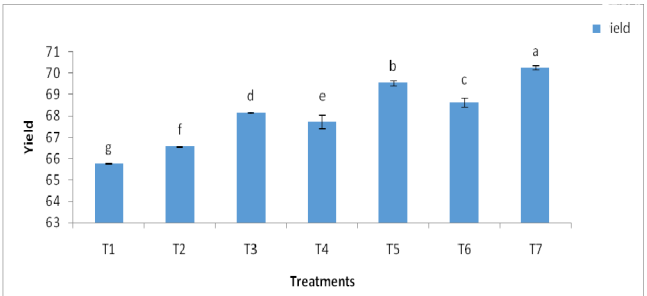
Effect of fly ash and micro nutrient on the no. of Grains cob



Effect of fly ash and micro nutrient on the Cob girth (cm)



Effect of fly ash and micro nutrient on the 100 seed weight(g)



Effect of fly ash and micro nutrient on the Yield (q ha^{-1})

plays major role when applied in combination with others. Maximum cob weight (141.57 g) was recorded with the application of RDF + fly ash + Zn + Fe (T_7). Maximum grains/cob (339.86) was recorded with the application of RDF + fly ash + Zn + Fe (T_7) whereas minimum grains/cob (304.93) were recorded under control (T_1).

An inquisition of the data reveals that maximum cob girth (14.03 cm) of maize crop under different treatments was recorded with the application of RDF + fly ash + Zn + Fe (T_7) whereas minimum cob girth (12.23) was recorded under treatment (T_1). Maximum grain rows per cob (13.26) was recorded with the application of RDF + fly ash + Zn + Fe. Whereas minimum grain rows per cob (11.20) was recorded under control treatment. Maximum Test weight of 100 seeds (26.00 gm) was recorded with the application of RDF+fly ash + Zn + Fe T_7 whereas minimum test weight (23.02) of maize crop treatments was recorded under control treatment. Maximum seed yield (70.27 q/ha.) was recorded with the application of RDF + fly ash + Zn + Fe(T_7) whereas minimum seed yield was recorded under treatment (T_1). It is noteworthy to mention here that, with use of micronutrients yield of maize plant get increased Tariq *et al.,* (2014) Stover yield (75.57 q/ha) was obtained maximum under the application RDF + fly ash + Zn + Fe (T_7) whereas Lowest stover yield (69.28 q/ha) was recorded under control (T_1). Arune *et al.,* (2006) also resulted that with foliar spray of $ZnSO_4$ (0.5%) and urea (2%) gave higher results of growth and yield Maximum harvest index (48.70) was recorded with the application of RDF (T_1) whereas minimum harvest index (48.18) was recorded under treatment (T_7).

Conclusion

The maximum number of cobs/plant (1.73) under the treatment T_7 (RDF + fly ash + Zn + Fe) which is followed by Treatment T_5 (RDF + fly ash + Zn) having number of cobs/plant is 1.53. The maximum cob length 18.17 cm under the treatment T_7 (RDF + fly ash + Zn + Fe) which is followed by Treatment T_5 (RDF + fly ash + Zn) having cob length 17.46 cm. The maximum grains/cob 339.86 was recorded under the treatment T_7 (RDF + fly ash + Zn + Fe) which is followed by Treatment T_5 (RDF + fly ash + Zn) having grains/cob 333.53. The maximum cob girth (14.03 cm) was measured under the treatment T_7 (RDF + fly ash + Zn + Fe) which is followed by Treatment T_5 (RDF + fly ash +Zn) having cob girth (13.78 cm). The maximum test weight (26.00 g) under the treatment T_7 (RDF+ fly ash+ Zn + Fe) which was followed by Treatment T_5 (RDF+fly ash + Zn) having test weight (25.32 g). The maximum seed yield (70.27 q ha^{-1}) under the treatment T_7 (RDF+ fly ash+ Zn + Fe) which was followed by Treatment T_5 (RDF + fly ash + Zn) having seed yield (69.55 q ha^{-1}) hence treatment T_7 (RDF+ fly ash+ Zn + Fe) is recommended for maize crop.

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