Original Article

Effect of Foliar Application of Organic And Inorganic Nutrient Solutions on Growth And Yield Of Maize (*Zea Mays* L.)

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Abstract

The field experiment was carried out a farmer's field in Sitheri village, Attur Taluk, Salem District, Tamil Nadu, India during kharif season of 2018 in order to evaluate the effect of foliar application of organic and inorganic nutrient solutions on growth, yield, nutrient uptake and economics of maize. The field is laid out with seven treatment and replicated thrice. The treatment consists of control water spray, polyfeed 1 %, DAP 2 %, humic acid 40 ppm, seaweed 10 %, panchagavya 3 %, vermiwash 2 % on 20 and 45 DAS. Among the different foliar application of organic and inorganic nutrients solutions tried out, foliar application of polyfeed @ 1% resulted in higher plant height on 30, 60 DAS and harvest (56.38, 143.50, 160.25 cm), dry matter production at harvest (12024 kg ha^{-1}), number of grains cob^{-1} (360), grain yield (4824 kg ha^{-1}) and stover yield (7132 kg ha^{-1}). The least parameters was observed in control treatment with plant height on 30, 60 DAS and harvest (35.71, 109.17, 125.85 cm), dry matter production (10730 kg ha^{-1}), number of grains cob^{-1} (310), grain yield (3852 kg ha^{-1}) and stover yield (6365 kg ha^{-1}).

Keywords: Maize, Polyfeed, Grain Yield.

INTRODUCTION

Maize (*Zea mays* L.) is one of the most important cereals grown and consumed in the world. Maize has been an important economic cereal crop in Indian economy because of its higher production potential and it is an efficient converter of solar energy into dry matter, compared to any other cereal crop and has adaptability to wide range of environments and the crop has very high genetic yield potential. It is a multipurpose crop that provides food for humans, feed for animals (especially poultry and livestock) and raw material for the production of oil, protein, starch, food sweetners, alcoholic beverages and fuel source. Maize is otherwise known as "Queen of cereals" or "miracle crop" (Brar *et al*., 2017). A number of factors are responsible for the decline in maize productivity, among which are inadequate crop feeding management and reduced soil fertility are among the most important factors responsible for the decline in maize production. It was also noted that one third of crop productivity was attributable to fertilizers and the rest depended on the efficient use of other agricultural inputs, however the efficiency of nutrient use for conventional fertilizers is barely limited to between 30 – 40 % (Safa and Hayyawi, 2021). Foliar application of water soluble fertilizers is already a known method of supplementation of plant nutrition. Nutrient uptake by leaves is considerably faster than the roots, foliar nutrition is extremely effective. Application of balanced fertilizer in critical stages of growth will greatly benefit level and quality of agricultural production (Dobrinoiu and Dumbrava, 2003). This method provides utilization of nutrients more efficiently and for correcting deficiencies rapidly especially for short duration crops. Recently, new generation specialty fertilizers have been introduced exclusively for foliar feeding and fertilization. Specialty fertilizers are a better source for foliar application.

MATERIALS AND METHODS

The field experiment was carried out a farmer's field in Sitheri village, Attur Taluk, Salem District, Tamil Nadu situated at 11°55' N latitude & 78° 79' E longitude and an altitude of 138 m above mean sea level during *kharif* season of 2018. The soil texture is clay loam, with a pH of 7.4 and electrical conductivity of 0.56 dSm^{-1} at the experimental site. Nitrogen, phosphorus, and potassium availability were low, medium, and high, respectively, at the experimental site. The experiment was laid out in a randomized block design, having seven treatments and replicated thrice. The following treatments were examined in experiment *viz.*, T_1 - Control water spray, T_2 - Polyfeed 1 % at 20 and 45 DAS, T_3 - DAP 2 % at 20 and 45 DAS, T_4 - Humic acid 40 ppm at 20 and 45 DAS, T_5 - Seaweed 10 % at 20 and 45 DAS, T_6 - Panchagavya

3 % at 20 and 45 DAS, T_7 - Vermiwash 2 % at 20 and 45 DAS. For this experiment, the maize hybrid CO-6 was chosen and it was seeded at a 60 x 20 cm spacing. The recommended fertilizers schedule of 250:75:75 N, P_2O_5 and K_2O kg ha^{-1} were applied as per fertilizer schedule. Urea (46% N), single super phosphate (16% P_2O_5) and muriate of potash (60% K_2O) fertilizers were used to supply N, P and K nutrients, respectively. The entire dose of phosphorus and potassium were applied basally. Half dose of nitrogen was applied basally and the remaining half dose of nitrogen was applied as two splits (top dressing) on 25 and 45 days after sowing.

A need-based approach to plant protection was taken based on the economic threshold of pests and diseases. The gross and net plot sizes were 5.4 x 4.0 m and 4.2 x 3.0 m respectively. The net plot area was used for the determination of crop yields. The crop observation was taken on 30 DAS, 60 DAS and harvest stage. Foliar fertilizer was applied twice, first at 20 DAS and again 45 DAS. Five samples in each plot were marked randomly for recording biometric observations. The observations were recorded at different stages of crop growth. The samples were air-dried first, then oven-dried at 70°C until they attained a uniform dry weight, which was then recorded. The mean dry weight was calculated in kg per hectare. The crops were harvested manually at physiological maturity and yield was taken at 14% moisture level. Using Gomez and Gomez's (1984) method, biometric data obtained from plant samples and computed data were all statistically examined. The critical difference was determined at a 5% probability level in cases where the F test indicated that the treatment difference was significant.

RESULTS AND DISCUSSION

Among the different foliar application of organic and inorganic solution sprayed on 20 and 45 DAS, 1% polyfeed spray recorded the highest plant height on 30, 60 DAS and harvest. Foliar application of polyfeed, recorded the highest plant height of 56.38 cm, 143.50 cm and 160.25 cm on 30, 60 DAS and harvest stage. It was followed by 2% Vermiwash spray with 53.16 cm, 138.15 cm, 154.88 cm respectively. The lowest plant height was recorded in control plot with 35.71 cm, 109.17 cm and 125.85 cm respectively. Foliar application of polyfeed increased the plant height upto 20.67 cm, 34.33 cm and 34.40 cm compared to control treatment. This might be due to positive effect of N, P, K which enhances the higher plant growth and canopy due to augment cell division and cell expansion (Mudalagiriyappa *et al*., 2016)

Foliar application of 1% polyfeed produced highest dry matter production of maize at harvest stage with 12024 kg ha^{-1} and it was followed by foliar application of 2% Vermiwash on 20 and 45 DAS. While applying polyfeed to maize crop on vegetative stage it increased the dry matter accumulation upto 12.05 % at harvest stage compared to control plot. The control plot recorded the lowest dry matter production with 10730 kg ha^{-1}. Increased dry matter production due to the beneficial effect of nutrients particularly NPK present in readily available form in this fertilizer which were supplied through foliar spray similar findings with Maravalli and Shekh, 2019. All the growth parameters were furnished in Table

1. The highest number of grains cob^{-1} produced by foliar application of polyfeed @ 1% on 20 and 45 DAS with 360 grains. While applying Vermiwash @ 2% the number of grains cob^{-1} was reduced 15 grains compared to polyfeed. The control plot recorded the lowest number of grains cob^{-1} with 310. The increased yield attributes with increased concentration of WSF might also be due to higher chlorophyll content with enhanced photosynthetic activity and higher uptake of nutrients and thereby increased plant dry matter production which might have improved the kernel development and number of kernel per plant and finally contributed for higher productivity. This was in accordance with the observations of (Mudalagiriyappa *et al*., 2016).

Among the different foliar application of organic and inorganic solutions tried out, foliar application of polyfeed @ 1% on 20 and 45 DAS (4824 kg ha^{-1}) produced higher grain yield in maize. It was followed by foliar application of Vermiwash @ 2% on 20 and 45 DAS (4724 kg ha^{-1}). The lowest grain yield was recorded in control plot with 3852 kg ha^{-1}. Foliar application of polyfeed increased the grain yield upto 25.23 % compared to control plot and foliar application of Vermiwash increased the grain yield of 872 kg. The similar trend was followed in straw yield. The foliar application of polyfeed @ 1% produced the highest stover yield (7132 kg ha^{-1}). It was followed by foliar application of Vermiwash @ 2% on 20 and 45 DAS (7090 kg ha^{-1}). The lowest stover yield was recorded in control plot with 6365 kg ha^{-1}. The biological yield is a function of green cob and green fodder yields. Thus, significant increase in biological yield with the application of WSF (19:19:19) could be ascribed to the improvement in yields might have resulted from favourable influence of N,P,K through water soluble fertilizer on growth and efficient partitioning of metabolites to reproductive structure. Further, higher nutrient uptake and better use of radiant energy led to higher vegetative and reproductive growth, thus enhancing biological yield. The results are also fall in the line of Maravalli and Shekh, 2019. All the yield parameters and yield expressed in Table 1.

CONCLUSION

Among the different organic and inorganic foliar application of nutrient solutions tried out, foliar application of polyfeed @ 1% on 20 and 45 DAS shown a highest growth and yield of maize.

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Table. 1 Effect of foliar application of organic and inorganic nutrient solutions on growth and yield of Maize (*Zea mays* L.)

Treatment	Plant Height (cm)			Dry Matter Production (kg ha^{-1})	No. of grains cob^{-1}	Grain Yield (kg ha^{-1})	Stover Yield (kg ha^{-1})
	30 DAS	60 DAS	Harvest				
T_1 - Control Water spray	35.71	109.17	125.85	10730	310	3852	6365
T_2 - Polyfeed 1 % at 20 and 45 DAS	56.38	143.50	160.25	12024	360	4824	7132
T_3 - DAP 2 % at 20 and 45 DAS	49.90	132.74	149.47	11728	345	4620	7040
T_4 - Humic acid 40 ppm at 20 and 45 DAS	43.23	121.66	138.37	11432	330	4402	6939
T_5 - Seaweed 10 % at 20 and 45 DAS	39.82	115.99	132.69	11175	322	4219	6865
T_6 - Panchagavya 3 % at 20 and 45 DAS	46.58	127.23	143.94	11562	337	4509	6985
T_7 - Vermiwash 2 % at 20 and 45 DAS	53.16	138.15	154.88	11882	352	4724	7090
SEd	1.47	2.44	2.45	64.30	3.36	43.04	18.26
CD (P=0.05)	3.16	5.25	5.26	138.25	7.22	92.54	39.25