The Pharma Innovation Journal 2023; 12(11): 1996-1998

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(11): 1996-1998

www.thepharmajournal.com
Received: 24-08-2023
Accepted: 02-10-2023

SB Deshmukh
PG Scholar, Agriculture College, VNMKV, Latur, Maharashtra, India

PN Karanjikar
Professor (Agronomy COA, Latur), Agriculture College, VNMKV, Latur, Maharashtra, India

PD Patil
PG Scholar, Agriculture College, VNMKV, Latur, Maharashtra, India

KS Sabne
PG Scholar, Agriculture College, VNMKV, Latur, Maharashtra, India

SJ Mamdi
PG Scholar, Agriculture College, VNMKV, Latur, Maharashtra, India

Corresponding Author:
SB Deshmukh
PG Scholar, Agriculture College, VNMKV, Latur, Maharashtra, India

Effect of humic acid and fertilizer on growth and yield of maize (*Zea mays* L.)

SB Deshmukh, PN Karanjikar, PD Patil, KS Sabne and SJ Mamdi

Abstract
Agronomical an investigation was carried out held during the kharif season of 2022-23 at the Experimental Farm, College of Agriculture, Latur. To investigate the impact of humic acid and fertilizer on growth and yield on maize. The experiment was designed using Randomized Block Design. The eight therapies were tested three times. The treatments were T_1: Control, T_2: 100% RDF, T_3: 75% RDF +10 kg Humic acid, T_4: 75% RDF + 15 kg humic acid, T_5: 75% RDF + 20 kg humic acid, T_6: 100% RDF + 10 kg humic acid, T_7: 100% RDF + 15 kg humic acid, T_8: 100% RDF + 20 kg humic acid. Each experimental unit's gross (total) and net plot sizes were 5.4 meter x 4.5 meter and 4.2 meter x 3.9 meter, respectively. On 4th July, 2022, sowing was carried out using the dibbling method and a seed rate of 15 kg ha^{-1}. For the maize crop, recommended dose of fertilizer was 150: 75: 75: kg NPK ha^{-1}. The result of experimental revealed that 100% RDF + 20 kg humic acid recorded significantly highest grain yield.

Keywords: Maize, RDF, Humic acid, yield, growth attributes, yield attributes

Introduction
Maize (*Zea mays* L.) is an annual plant which belongs to family Gramineae and Genus Zea. (*Zea mays* L.) have 10 pairs of chromosome. Due to its exceptional ability to harness sunlight for greater yields, even under intense solar conditions, maize is rightfully dubbed the "Queen of Cereals." This remarkable capability stems from its C4 photosynthetic pathway, which optimizes sunlight absorption and utilization. In India, maize (*Zea mays* L.), the third most important cereal crop after rice and wheat, stands as a versatile staple, providing sustenance for both humans and livestock while serving as a cornerstone for a diverse range of industrial products, including starch, protein, oil, alcoholic beverages, food sweeteners, cosmetics, and biofuels. The grain can be consumed as human food, fermented to produce a wide range of food and beverages, feed to live stock and used as industrial input in the production of starch, protein, oil, sugar, ethyl alcohol etc. Beyond its role as a staple food, maize's versatility extends to its roots, which can be employed for mulching, soil enhancement, or as a fuel source. Its utilization spans across various sectors, including human food (24%), animal feed (11%), poultry feed (52%), starch production (11%), and the brewing industry (1%). In India, maize is cultivated on 9.86 million ha area with a production of 31.51 million tonnes having an average productivity of more than 3195 kg ha^{-1}. Maize cultivation is spread throughout the year in different regions of India, showcasing its adaptability to diverse climatic conditions. The major maize growing states are Karnataka (16.45%), Madhya Pradesh (11.37%), Maharashtra (10.91%), Tamil Nadu (8.63%), West Bengal (7.76%).
Fertilizer is one of the important inputs in agriculture and the use of right amount of fertilizer, at right time, in right quantity is fundamental for farm profitability and environmental protection. Imbalanced use of fertilizer by farmers not only reduces the yield of the crop but also deteriorates the quality of soil and water resource. While not directly providing nutrients to plants like conventional fertilizers, humic acid plays a complementary role in enhancing soil health and promoting plant growth. This natural organic polymeric compound, a key component of soil humus, offers a multitude of benefits: to improve soil health, increase absorption of food elements, minerals and nutrients, helps to control pathogenic factors, increase root volume, cause effectiveness of root system, accelerate root growth speed, enhance germination of seed, increase performance of dry matter, increase permeability of plant membrane and finally helps in increasing quality of products. Humic acid considered as inseparable and integral part of soil fertility and fertilization program. Humic acid has received the most attention and been extensively studied to find out its effect on several crop plants. The impact of humic acid and fertilizers on growth and yield of maize (*Zea mays* L.) was the subject of an experiment.

Material and Methods

An agronomic analysis was carried out to determine the impact of humic acid and fertilizer on growth and yield of maize (*Zea mays* L.) during *Kharif* season of 2022-2023 at Experimental Department, Agriculture College, Latur. The experimental site featured a clay-like soil texture with a moderately alkaline reaction (pH 7.03). Prior to sowing, the soil's nutrient profile revealed low levels of available nitrogen (229.0 kg ha^{-1}), moderate levels of available phosphorus (16.85 kg ha^{-1}) and very high levels of available potassium (434.0 kg ha^{-1}). The site's well-drained nature facilitated optimal maize growth. After harvest soil's nutrient status revealed a decrease in available nitrogen (212.0 kg ha^{-1}), while available phosphorus (14.18 kg ha^{-1}) remained moderate and available potassium (392.0 kg ha^{-1}) continued to be very high.

Eight treatments were duplicated three times in the randomized block design (RBD) experiment. The treatments were T_1: Control, T_2: 100% RDF, T_3: 75% RDF +10 kg Humic acid, T_4: 75% RDF + 15 kg humic acid, T_5: 75% RDF + 20 kg humic acid, T_6: 100% RDF + 10 kg humic acid, T_7: 100% RDF + 15 kg humic acid, T_8: 100% RDF + 20 kg humic acid. Each experimental unit's gross (total) and net plot sizes were 5.4 meter x 4.5 meter and 4.2 meter x 3.9 meter, respectively. On 4^{th} July, 2022, seeds were sown using the dibbling method with a seed rate of 15 kg ha^{-1}. For the maize crop, recommended dose of fertilizer (RDF) was 150:75:75 kg NPK. On 4^{th} July, 2022, as per protocols, pure seeds of maize variety Ruchi-445 was sowed using the dibbling technique. The harvest took place on October 30, 2022.

Results and Discussion

Growth Attributes

The application of humic acid in combination with recommended fertilizer doses (RDF) significantly enhanced maize growth parameters, including plant height, number of functional leaves, and leaf area. Treatment (T_8), which involved the application of 100% RDF along with 20 kg of humic acid, resulted in the highest growth attributes: plant height (220.31 cm), no. of functional leaves $plant^{-1}$ (8.41), leaf area (46.25 dm^2) and dry matter accumulation (186.57 g). It was much better than the remaining treatments and at par with treatments T_7 **(**100% RDF + 15 kg humic acid) and T_6 **(**100% RDF + 10 kg humic acid). The increase in plant height, no. of functional leaves, leaf area and dry matter might be due role of RDF and humic acid, they helped to increase the nutrient availability, improved uptake, translocation of macronutrients, chlorophyll retention, vegetative growth and promoted the activities of cytokinins and delayed synthesis of ABA. The positive effects of humic acid and fertilizer on maize growth are consistent with previous research conducted by Dubey *et al*., (2006) [5], Channabasavanna *et al*., (2007) [3], Gable *et al*., (2008) [6], Dhoke *et al*., (2010) [4], Mohana *et al*., (2014) [8], Abaka *et al*., (2016) [1], Bilal *et al*., (2016) [2], Satybhan *et al*., (2018) [10].

Yield Attributes

The study evaluated various yield parameters including the no. of grains per cob, weight of cobs per plant (g), weight of grain per plant (g), seed index (g), grain yield per plant (g), grain yield (kg ha^{-1}), stover yield (kg ha^{-1}) and biological yield (kg ha^{-1}). The effect of humic acid and fertilizer was found significant on yield and yield attributes. Maximum weight of cobs per plant (298 g), number of grains per cob (695.00), weight of grain per plant (190 g), seed index (29.40 g), grain yield (5985 kg ha^{-1}), stover yield (8845 kg ha^{-1}), biological yield (14830 kg ha^{-1}), harvest index (40.35%) was obtained with the application of 100% RDF + 20 kg humic acid at (T_8) and it was followed by 100% RDF + 15 kg humic acid (T_7) and 100% RDF + 10 kg humic acid (T_6). This might be due to built up of sufficient food reserves because of effective photosynthesis during flowers and seed developing stage promoted proper grain filling and thus contributing to higher yield attributes. The positive effects of humic acid and fertilizer on maize growth are consistent with previous research conducted by Dubey *et al*., (2006) [5], Channabasavanna *et al*., (2007) [3], Gable *et al*., (2008) [6], Dhoke *et al*., (2010) [4], Mohana *et al*., (2014) [8], Abaka *et al*., (2016) [1], Bilal *et al*., (2016) [2], Satybhan *et al*., (2018) [10].

Table 1: Effect of different treatments on growth- related attributes of maize.

Treatments	Plant height	No. of leaves	Leaf area	Dry matter
T_1 - Control	174.30	11.64	55.53	149.08
T_2 – 100% RDF	184.76	12.33	60.30	156.58
T_3 – 75% RDF + 10 kg HA	178.69	11.91	58.77	151.39
T_4 – 75% RDF + 15 kg HA	183.92	12.28	59.87	154.81
T_5 – 75% RDF + 20 kg HA	184.97	12.34	63.00	158.17
T_6 – 100% RDF + 10 kg HA	191.22	12.78	64.43	162.67
T_7 – 100% RDF + 15 kg HA	196.36	13.57	71.56	177.20
T_8 – 100% RDF + 20 kg HA	220.31	14.91	74.64	186.57
S.E(m) ±	9.91	0.77	3.46	8.05
CD at 5%	30.05	2.35	10.52	24.41
General mean	188.82	12.69	64.78	161.72

Table 2: Effect of different treatments on yield- related attributes of maize

Treatments	No. of grains cob^{-1}	Cob wt. plant^{-1} (g)	Weight of grain cob^{-1} (g)	Grain yield plant^{-1} (g)	Seed Index (g)	Grain yield (kg ha^{-1})	Stover yield (kg ha^{-1})
T_1 - Control	538.33	228	138	62.74	23.40	2788	6063
T_2 – 100% RDF	585.00	243	156	64.59	25.44	4373	7432
T_3 – 75% RDF + 10 kg HA	570.00	238	142	67.55	24.30	3435	6950
T_4 – 75% RDF + 15 kg HA	580.00	242	148	67.95	25.10	4250	7122
T_5 – 75% RDF + 20 kg HA	588.00	248	162	68.88	25.93	4698	7580
T_6 – 100% RDF + 10 kg HA	590.00	256	164	80.88	26.70	5176	8330
T_7 – 100% RDF + 15 kg HA	656.67	281	180	81.94	26.98	5488	8553
T_8 – 100% RDF + 20 kg HA	695.00	298	190	82.01	30.43	5985	8844
S.E(m) ±	33.37	13.91	8.75	4.28	1.29	288	406
CD at 5%	101.23	42.21	26.54	12.99	3.93	875	1231
General mean	600.37	253.5	162.13	73.66	25.90	4512	7609

Conclusion

Implementation of 100% RDF + 20 kg humic acid (T_8) proved to be effective for getting higher growth attributes, yield attributes, GMR, NMR, and B: C ratio of maize which was followed by 100% RDF + 15 kg humic acid (T_7) and 100% RDF + 10 kg humic acid (T_6).

References

1. Abaka K, Khalil SK, Khan F, Qahar A, Sharif M, Zamin M. Phenology, yield and yield components of maize as affected by humic acid and nitrogen. Journal of Agricultural Science. 2016;6(7):286.
2. Bilal M, Umer M, Khan I, Munir H, Ahmad A, Usman M, Iqbal R. Interactive effect of phosphorous and humic acid on growth, yield and related attribute of maize. Journal of. Agricultural Research. 2016;54(3):33-45.
3. Channabasavanna AS, Nagappa R, Biradar DP. Effect of integrated nutrient management on productivity, profitability and sustainability of irrigated maize. Karnataka Journal of Agricultural Science. 2007;20(4):837-839.
4. Dhoke S, Kumar VJ. Effect of different levels of RDF on growth, yield and quality of maize. Asian Journal of Plant Science. 2010;31(2):109-111.
5. Dubey S, Purohit KK, Sarawagi SK. Effect of integrated nutrient management on yield and yield attributes of hybrid maize (*Zea mays* L.). Journal of Agriculture Issues. 2006;11(2):79-81.
6. Gable. Effect of NPK application on growth and yield of maize. Indian Journal of Agronomy. 2008;9(1):56-57.
7. Kar PP, Barik KC, Mahapatra PK, Garnayak LM, Rath BS, Bastia DK, *et al*. Effect of planting geometry and nitrogen on yield, economics and nitrogen uptake of sweet corn (*Zea mays*). Indian Journal of Agronomy. 2006;51(1):43-45.
8. Mohana A, Suleiman M, Khedr W. Effect of humic acid and rates of nitrogen fertilizer on yield and yield components of corn (*Zea mays* L.). Jordan Journal of Agricultural Science. 2015;17(4):55-56.
9. Priya S, Kaushik MK, Sharma SK, Kumawa, P. Impact of integrated nutrient management on growth and productivity of hybrid maize (*Zea mays* L.). Annals of Biology. 2014;30(1):106-108.
10. Satybhan S., Singh V, Shukla RD, Singh K. Effect of fertilizer levels and and bio-fertilizer on cob yield of maize (*Zea mays* L.). International Journal of Chemical Studies. 2018;6(2):2188-2190.
11. Tan KH, Nopamornbodi V. Effect of different levels of humic acids on nutrient content and growth of corn (*Zea mays* L.). Plant and soil Journal. 1979;51(2):283-287.
12. Thakur GD, Karanjikar PN, Kasbe AB. Effect of fertilizer levels on yield and yield contributing characters of maize. Asian Journal of Soil Science. 2010;4(2):280-282.