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Effect of Nano DAP and Urea on growth, Yield and Quality of Chilli (*Capsicum annuum* L.)

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ABSTRACT

An experiment was conducted at Department of Vegetable Science, College of Horticulture, Mudigere during the year 2022-23. The experiment was laid out in Randomized Complete Block Design (RCBD) with ten treatments and three replications to evaluate growth, yield and quality parameters of chilli. Among the treatments, treatment (T_9) consisting of 6ml of Nano DAP and Urea (100% RNP- recommended dose of Nitrogen and phosphorus) significantly recorded maximum plant height (74.48 cm), number of leaves per plant (315.60), internodal length (8.02 cm), number of primary branches per plant (15.12), leaf area per plant (8673 m^2), leaf area index (3.212), total chlorophyll content (2.25 mg/g), Ascorbic acid content (135.07 mg/100 g) is on par with T_6 andT_6 consisting of 6 ml of Nano DAP and Urea (75% RNP - recommended dose of Nitrogen and phosphorus), Significantly recorded maximum number of fruits per plant (265.29), Average fruit weight (7.27 g), fruit yield per plant (739.16 g), Fruit yield Per Plot (18.87 kg), Fruit yield tonnes per/ha (27.70 tonnes/ha) is on par with T_9 compared to control. Finally, it can be inferred that among the treatments, T_9 consisting of 6 ml of Nano DAP and Urea+ 100% RNP showed the better growth and quality parameters and T_6 consisting of 6 ml of Nano DAP and Urea+ 75% RNP showed the better yield parameters compared to control. Hence this can be recommended for commercial cultivation of chilli.

***Key words**: Chilli, Nano DAP, Nano Urea.*

Introduction

Chilli (*Capsicum annuum* L.) is an important vegetable and spice crop which is commercially cultivated in tropical and sub-tropical regions. It requires a combination of warm and humid weather. A temperature range of 20 -30 °C is optimum for chilli. The growth and yield of vegetable crops are mainly depending on the quality and quantity offertilizers used. Loss of mineral nutrients through leaching and surface runoff along with abundant volatilization constitute growing concern sowing to economic losses and environmental pollution. The use of chemical fertilizers has resulted in many serious, environmental problems such as accumulation of heavy metals in soil and plant systems. Conventional application techniques are resulting in seriously over dosing of chemical fertilizers.

Nanotechnology is a promising field of research which utilizes nanomaterials of less than100 nm

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size, may offer an unprecedented opportunity to develop concentrated sources of plant nutrients having higher-absorption rate, utilization efficacy and minimum losses. One of the most important uses of nano technology is nano fertilizer, which improves the ability of the plants to absorb nutrients.

Materials and Methods

To study the effect of Nano DAP and Urea on growth, yield and quality of chilli (*Capsicum annuum* L.). The field experiment was conducted at College of Horticulture, Mudigere during *Summer* season 2022-2023. The experiment was laid out in a Randomised Complete Block Design (RCBD) with Ten treatments and three replications. The seedlings were Transplanting in Ridge and furrow method at a distance of 60 cm between row to row and 45 cm between plants. All the recommended cultural operations were followed and observations were recorded in five randomly selected plants per replication of all the treatments.

The treatment details as follows

T_1 - 50% RNP + 2 ml NDS + 2 ml NUS at 45 DAT and 60 DAT
T_2 - 50% RNP + 2 ml NDS + 2 ml NUS at 45 DAT and 60 DAT
T_3 - 50% RNP + 2 ml NDS + 2 ml NUS at 45 DAT and 60 DAT
T_4 - 75% RNP + 2 ml NDS + 2 ml NUS at 45 DAT and 60 DAT
T_5 - 75% RNP + 2 ml NDS + 2 ml NUS at 45 DAT and 60 DAT
T_6 - 75% RNP + 2 ml NDS + 2 ml NUS at 45 DAT and 60 DAT
T_7 - 100% RNP + 2 ml NDS + 2 ml NUS at 45 DAT and 60 DAT
T_8 - 100% RNP + 2 ml NDS + 2 ml NUS at 45 DAT and 60 DAT
T_9 - 100% RNP + 2 ml NDS + 2 ml NUS at 45 DAT and 60 DAT
T_{10} - Control

Well decomposed FYM @ 25 tonnes per hectare was applied at the time of land preparation. The recommended dose 150:75:75 kg NPK/ha was applied in the form of urea, rock phosphate and muriate of potash, respectively. Nano DAP and Nano Urea were sprayed at 45 and 60 Days after transplanting. observations are recorded on growth, yield and quality parameters at 60, 90 and 120 Days after transplanting.

Results and Discussion

The findings were considerably interpreted and listed in Table 1 based on the observations recorded in the present research.

Nano DAP and Urea at 6 ml + 100 % RNP shows significant results in increase in plant height (74.18 cm), Number of leaves per plant (315.40), inter nodal length (8.02 cm), total number of primary branches per plant (15.12), leaf area per plant (8673.23 cm^2), leaf area index per plant (3.212) increase in growth parameters is might be due to adequate supply of nitrogen and phosphorus which accelerate the activity of enzymes and auxin metabolism in the plant, which in turn enlarge of the cell division and cell elongation. increased availability of nitrogen and phosphorus, which is an important constituent of chlorophyll and proteins and efficient photosynthesis and increasing the absorption of ions and their distribution in plants and affecting metabolic reactions high water and mineral consumption of plants. These results are in conformity with the results findings by, Ajirloo *et al*. (2015) in tomato, Drostkar *et al*. (2016) in chickpea, Merghany *et al*. (2019) in cucumber and Al Jabri *et al*. (2020) in okra and Mishra *et al.* (2020) in tomato.

Increase in number of fruits per plant, average fruit weight, fruit yield per plant, fruit yield per plot and fruit yield in tonnes per hectare, which might be due to regulating semi permeability of cell walls, thus mobilizing more water content into fruit and increasing the size of fruits. this might have enabled to accumulate more carbohydrate into the storage organs which might have led to the increased fruit weight and nutrient use efficiency throughout the cropping period which might have enhanced the translocation of photosynthates from source to sink and the major macronutrient such as nitrogen resulted beneficial effects of microflora might have played a role in producing more number of flowers and that helps for production of more number of fruits, which resulted in increased number of fruits per plant and lead to a maximum number of harvest and more number of fruits per square meter and ultimately increases fruits yield. Ajirloo *et al.* (2015) in tomato, Merghany *et al*. (2019) in cucumber. Panda *et al.* (2020) and Mishra *et al.* (2020) in tomato.

Increase in chlorophyll content and Ascorbic acid content due to this might be due to promotion of the absorption and utilization of nutrients such as nitrogen and phosphorus by nano sized particles which have massive surface area and they also possess smart delivery system, i.e., controlled release pattern of nutrients which in turn increases the nutrient use efficiency of crop and which is an important constituent of chlorophyll and proteins and efficient

Table 1. Effect of Nano DAP and Urea on Growth, Yield and Quality of chilli.

Treatment No.	Plant height (cm)	Number of leaves	Inter nodal length (cm)	Number of primary branches	Leaf area per plant (cm^2)	Leaf area index	Total number of fruits per plant	Average fruit weight (g)	Fruit yield per plant (g)	Fruit yield per plot (kg)	Fruit yield in tonnes per hactare (tonnes/ha)	Total Chlorophyll content (mg/g)	Ascorbic acid content (mg/100g)
T_1	54.92	253.80	6.42	11.63	6243.56	2.312	181.54	4.23	537.43	15.51	20.86	1.74	120.20
T_2	63.98	262.20	7.18	13.21	7132.12	2.641	208.47	5.13	651.31	16.28	22.62	1.97	126.31
T_3	70.94	289.20	7.78	14.27	8234.43	3.049	251.27	6.31	711.19	17.34	25.82	2.23	131.53
T_4	56.94	256.60	6.64	12.13	6564.32	2.431	189.52	4.42	549.31	15.67	21.95	1.83	122.37
T_5	65.76	268.60	7.32	13.47	7323.41	2.712	213.56	5.43	663.23	16.89	23.45	2.06	127.18
T_6	72.06	298.20	7.88	14.83	8453.24	3.130	265.29	7.27	739.16	18.87	27.70	2.29	134.58
T_7	59.64	258.40	6.82	12.67	6784.16	2.512	198.20	4.76	559.31	15.89	22.24	1.91	124.77
T_8	67.04	279.60	7.58	13.85	7543.31	2.793	223.32	5.82	689.72	16.96	24.65	2.14	129.20
T_9	74.48	315.40	8.02	15.12	8673.23	3.212	258.01	6.82	728.23	18.26	26.75	2.34	135.07
Control	47.18	238.60	5.12	9.26	5786.45	2.142	172.22	3.85	489.23	13.67	20.15	1.48	115.20
S. Em±	0.82	3.81	0.10	0.22	129.25	0.05	3.02	0.09	10.15	0.25	0.33	0.03	2.22
CD @ (5%)	2.43	11.31	0.23	0.65	384.01	0.13	8.97	0.26	30.15	0.75	0.98	0.09	6.60

photosynthesis and increasing the absorption of ions and their distribution in plants and nano fertilizer in foliar spray have significant effect on ascorbic acid which act as an antioxidant and also natural protector. These results are in conformity with the results findings by, Ajirloo *et al*. (2015) in tomato, Merghany *et al.* (2019) in cucumber, Al Jabri *et al*. (2020) in okra. And AL-Kaby *et al*. (2021) in okra and Al-juthery *et al.* (2020) in potato.

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Conflict of interest

The authors have declared that no conflict of interest exists.

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