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Effect of Bioneema and Nitrogenous Fertilizer on Growth Parameters, Drymatter Content, Yield attributes and Availability of Nutrients in Tomato (Lycopersicon esculentum Mill) C.V. Money Maker

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Abstract:- A field trial was displayed in (1x1 Sq.M.) micro plots during winter season (2008-09 and 2009-10) to study effect of neem product Bioneem and nitrogenous fertilizer (Urea) on growth, dry matter no. of tomato fruits, yield and nutrients availability. Experiment was conducted in factorial randomized block design (RBD) by varying levels of Bioneema (viz., B_0 (control), B_3, (20 Kg^{ha-l}), B_2 (40 Kg^{ha-l}), and B_1 (60 Kg^{ha-1}) and Nitrogen N. (Control) N, (50 Kg^{ha-1}) and N_2 (100 Kg^{hal-1}). It is quite obvious that treatment B_2N_1 (40 kg Bioneema + 50 Kg^{hn} N) through Urea brought about significant improvement in height, No of branches of tomato plants at various successive stages in (2008-09 and 2009-2010) at 90 DAT where B_3N, (T_{10}) significantly enhanced the no. of branches. It is further revealed that treatment Ts (B_2N) registered a tremendous increase in Drymatter % in first year while T10 (B_3N_0) showed better result in second year. Likewise T_{12}(B_3N_2) significantly increased the no. of fruits while T_{11} (B_3N_1) enhanced in second year. The Treatment T_9 (B_2N_2) responded well in enhancing the fruit yield in first year whereas T_3 (B_0N_2) improved the fruit yield (5-11 Kg. per plot). The uptake of nutrients i.e. N, Protein, P, Mg and Fe contents in general influenced significantly by bioneema and nitrogenous fertilizer (Urea). The uptake of nutrients was virtually higher in tomato plants of B_2N_2 and B_3N_1treatments in first year than that of second year.

It is inferred from the foregoing observations that less amount of N fertilizer along with Neem product is quite beneficial for plants growth, yield as well as disease resistance.

Keyword:- *Bioneema, Nitrogenous fertilizer, Drymatter, Yield, attributes, Lycopersicon esculentum, Nutrients.*

I. INTRODUCTION

Tomato (Lycopersicon, esculentum, Mill) is one of the most popular and widely grown vegetable in the world ranking second in importance to potato in many countries Fageria et al (2003). India is the second largest producer of Tomato in the world after China, accounting for about 11% of the world tomato Production **Anonymous (2011).** Tomato is a rich source of Vit-A, Vit-C and lycopene. Because of its high nutritive value, it has great demand as raw, cooked and processed vegetable. A number of processed products like paste, puree, soup, juice, ketchup, drinks, whole peeled tomatoes etc. are prepared on large scale and used as food ingredients Kalloo (1991). Thus, today it is one of the important raw materials for multimillion food industry. Besides nutritional importance tomato also has great medicinal value. Consumption of tomato fruits helps in the prevention of cancer and heart diseases because of antioxidant properties of Lycopene Kaur et al (2013).

Neem products with or without azadirachtin has shown excellent pest control action against infestation by over three hundred insect, pest and infection by nematode, viruses and some pathogenic fungus. Neem cultivation has been taken up over 160 countries registered in both in India as well as abroad.

India has a rich heritage on Neem (Azadirachta indica), It is a native of the Indian subcontinent and is highly esteemed tree for the people in the region. Neem has multifarious effects viz antifidant, repellant, toxicant, insect growth inhibitor and antibiopasitory against insects and pests.

The soil amendment with Neem cake and green manuring with Neem leaves were deletarious to various plant parasite nematodes which causes severe losses in tomato. All these reports are considered as a source of multiple pesticide; with these diversified mode and spectrum of action Neem offer an ideal pesticide which is also safe to environment and other natural enemies or pests.

Nitrification retarding studies some Neem compound viz azodirachtin, Nimbin Solanin etc. and new active constituents epinimbin and bioneem as the Key nitrification retarder. since nitrification inhibitory effect on neem Cake is well established. It is usefully employed in increasing the efficiency of urea.

Urea is the most important and widely used fertilizer. It is highly concentrated organic nitrogenous containing 46% N in amide form, 20 percent Carbon, 26.6% oxygen and 6.7% of hydrogen.

Several workers have studied the effect of Bioneema and urea on various growth parameters, yield and Nutrients uptake in tomato but very meagre information are available on this aspect. Keeping these facts in view, the present study

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was undertaken to evaluate the effect of Bioneema and urea as nitrogenous fertilizer.

II. MATERIAL AND METHOD

A field experiment was carried out in micro plots having size of (1×1 Sq.m.) at experimental site St. John's College, Agra during winter season. The test crop Moneymaker was transplanted on 15 Nov., 2008 at evening time at a distance of 50 cm plant to plant and 50 cm row to row. The micro plots used for experimental work had soil pH (1.2.5) soil water suspension ECE (dsm^{-1}) at 25°C 1.15% organic carbon, 0.35 available N 185 Kg^{-ha-1}, P_2O_5, $K_2O180Kg^{h-1}$, 14,0 Kg^{h-1}, and Zinc 0.85 mg Kg^{-1} The experiment was laid out in factorial randomised block design with three replications of twelve treatments.

The four levels of Bioneema 0.0 (B_0), B_1 (20 Kg^{h-1}), B_2 (40 Kg^{h-l}) and B_3 (60 Kg^{h-l}) and three levels of Nitrogen through urea viz N_0 (control), N_1 (50 Kg^{h-1}) and N_2 (100 Kg^{h-l}) were used. After dividing the experimental area in 36 micro plots the recommended doze of fertilizer (urea) and Bioneema were mixed before transplanting the seedlings. The recommended doze of N, P, K through urea S.S.P. and Muriate of Potash were applied in experimental plots before transplanting the seedlings. Rest half doze of N through urea was tap dressed before flowering the test crop. The crop was irrigated as and when required. The growth parameters at different intervals i.e. 30, 45, 60, 90 DAT in both the years were recorded. The no. of fruits / plot, yield of tomato per plot and drymatter at maturity stage were observed. The plant samples were collected from each plot for the analysis of N, protein, P. Mg, Fe uptake.

The height (cm) of the plant from ground level was recorded at 30, 45, 60 and 90 days after transplanting in both the trails for this purpose two plants were randomly selected from each plot and tagged for further observations, Similarly no. of branches of tomato under differents treatment were also done in the same manner as that of previous one. Drymatter accumulation Green herbage from plot by plot were collected and fresh weight was taken and then kept in oven maintained at 105°C for 8 hrs. The dried herbage was then weighed after cooling. The difference in weight between the green herbage and dried matter accumulation was recorded. The no. of fruits and yield of tomato was recorded at maturity level. After tomato crop; five random plants samples were taken out and dried and analysed for various nutrients. P in plant was estimated by adopting vanadomolybdate yellow colour method **Jackson (1973)** Nitrogen in plant was determined by using modified Kjeldahl method. The uptake of nutrients was calculated on the basis of yield and content of nutrients. Ca was estimated by flame photometer and Fe was determined by atomic absorption spectrophotometer.

III. RESULT AND DISCUSSION

The data (Table 1) pertaining to growth parameter (height of plant and no. of branches) at various successive stages / intervals as affected by varying levels of Bioneema and Nitrogenous fertilizer (Urea) clearly indicated that height of tomato plants under the influence of neem product (Bioneema) and urea showed a remarkable increase in height and no. of branches before flowering stage. The treatment To (B_2N_2) increased the height of plants to the extent of (87.0 cm) in lyr, and (59.6 cm.) in second year (2009-2010). The higher application of bioneema and nitrogen (B_3N_2) did not influence appreciably on the height of plants (Ist yr.) as well as second year. The reason for enhancement in the height of plants due to Bioneema and nitrogen may help in elongation which protects, the plant from various insect and diseases. These results also corroborate the findings of Das and Patro (1990), Mozarkat (1991), who also conducted and reported that application of PGR increased the growth of plants. The effect reduced plant growth it is surprising to note that the height bit some extent (58.6 cm) in year. The no. of branches increased with the rise in Bioneema and nitrogen levels over control. Probably this may due to the cell division and growth which is owing to the presence of Neem Product and Nitrogen as basal application Kar (1985), also observed similar findings

Data presented in (Table 2) pertaining to drymatter accumulation (%), No. of fruits and yield of tomato found significantly over control at B_2N_1. The higher concentration of Bioneema and nitrogen did not encourage to grow more drymatter content. It is further revealed from the data that average yield of tomato fruits with application of Bioneema and nitrogen clearly showed that fruit yield significantly increased over rest of the treatments. Beyond the treatment $B_3N_2$the yield declined. The highest yield recorded at T_9 (B_2N_2) in first year (6.68 Kg/Plot and 5.11 Kg./Plot) which is slightly reduced in second year (2009-2010). The Similar findings also showed by **Dostal and Wileax (1971)**.

It is obvious from the data depicted in Table 3 that. N uptake significantly increased with increasing level of Bioneema and Nitrogenous fertilizer (urea). The N uptake increased from 0.106 (Control) to the extent of (0.214)% at T_8(B_2N_1) in first year whereas in second year it enhanced from 0.101% (control) to (0.209%) at B_2N_2. Similarly in protein content increased from 0.588% (B_3N_2) in first year and enhanced upto 1.096 (B_3N_0) at T10 in second year. It is interested to note that increasing level of Bioneema and N level the N uptake tremendously reduced over control. It is evident from the findings that Neem product enhanced the N fixation which acted as good N inhibitor Reddy and Prasad (1977), Das and Padhi (1991) and Das and Patro (1990).

It is quite obvious from the results pertaining to protein that B_1N_0 treatment enhanced the protein. The antagonistic effect of Nitrogen over Bioneema was found to superior and showed better result in second year (2009-2010). It is further revealed that P uptake increased with increasing level of Bioneema and Nitrogen (Urea). The P content observed highest at B_2N_2 levels is both the year but, P uptake was higher in first year than of second year. P in also responsible for bringing the maturity in plants Application of 60 Kg^{ha-l} Bionemma and 100 Kg N through urea tended to enhance the Mg uptake in tomato plant while it reduced in first year. This reduction in Mg may be due to the hindrance caused by increased concentration of Na ions in the absorption and translocation of Mg from the roots to the above ground parts. No particular trend in increasing or decreasing manner

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could be observed. Mg is very important secondary plant nutrients from the growth and health of plant which is present in the Chlorophyll plant pigment. **David and Winser (1967).**

It is evident from the results presented in Table 3 that Fe uptake increased significantly over control with the rise in Neem product and Nitrogen levels. The highest uptake of Fe increased at B_2N_2 (40 Kg) Bioneema + 100 kg N and Fe concentration reduced after higher application of Bioneema and urea in both the years.

The results of this study leads to a conclusion that Bioneema a Neem product and nitrogenous fertilizer (urea) had remarkable effect on all the parameters. But above all B_2N_2 treatment found to be the most superior in the first year than that of second year.

Treatment		Height of Plant (Cm)								Number of Branches							
		2008-2009				2009-2010				2008-2009				2009-2010			
		30 DAT	45 DAT	60 DAT	90 DAT	30 DAT	45 DAT	60 DAT	90 DAT	30 DAT	45 DAT	60 DAT	90 DAT	30 DAT	45 DAT	60 DAT	90 DAT
T_1	B_0N_0	10.0	16.3	29.6	69.6	09.0	14.7	21.0	43.6	3.6	6.6	86	13.6	2.6	3.3	4.3	6.6
T_2	B_0N_1	13.0	20.6	37.0	78.3	11.6	17.0	24.0	46.0	3.5	7.3	10.3	15.3	4.6	5.3	6.3	8.0
T_3	B_0N_2	14.0	22.0	38.0	79.3	12.3	17.6	24.6	48.3	5.2	7.3	10.3	14.6	4.3	5.3	6.3	8.0
T_4	B_1N_0	13.0	20.6	37.0	78.6	12.0	16.0	21.3	43.0	5.0	7.2	10.3	15.6	3.6	4.3	6.0	7.0
T_5	B_1N_1	15.0	23.0	38.3	80.6	13.0	18.0	25.6	48.3	5.6	7.6	10.6	15.3	4.6	5.3	6.6	8.0
T_6	B_2N_0	14.6	21.0	38.6	80.5	13.6	17.6	25.5	48.6	5.5	7.6	10.6	15.3	4.3	5.3	6.3	8.0
T_7	B_2N_1	14.5	22.5	38.3	80.3	12.5	18.3	27.3	50.6	5.3	7.3	10.3	15.3	4.3	5.0	6.3	8.6
T_8	B_2N_2	19.6	29.3	45.6	87.0	16.6	21.6	29.6	59.6	7.3	9.3	12.3	17.0	5.6	6.8	7.8	9.0
T_9	B_3N_0	18.0	27.0	40.2	80.3	15.0	20.6	28.3	57.3	5.6	7.6	10.6	15.0	4.6	4.6	5.6	70
T_{10}	B_3N_1	14.	27.0	40.1	81.5	12.6	18.0	27.3	59.0	5.0	8.0	11.0	16.0	5.3	6.6	7.6	10.0
T_{11}	B_3N_2	18.3	22.6	39.3	81.0	15.3	19.3	21.3	57.0	5.3	7.3	10.3	15.3	3.4	5.3	6.0	8.0
T_{12}		17.0	26.6	39.6	81.6	14.5	21.0	28.8	57.6	6.0	8.3	11.0	16.0	5.0	6.0	7.0	9.0
CD at 5%		**3.13**	**2.71**	**1.59**	**1.37**	**6.89**	**5.96**	**7.86**	**7.80**	**0.59**	**0.51**	**0.013**	**0.012**	**0.16**	**0.26**	**1.89**	**1.75**

Table 1: Effect of varying Levels of Bioneema and Nitrogenous fertilizer on different growth Parameters in Tomato

Treatment		Dry Matter (%)		Number of Fruits		Yield of Fruits/Pot (Kg)	
		2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
T_1	B_0N_0	15.37	12.44	33.3	27.3	2.25	1.46
T_2	B_0N_1	14.32	13.17	40.0	32.0	6.24	3.34
T_3	B_0N_2	16.35	13.55	40.0	33.6	646	5.11
T_4	B_1N_0	15.89	12.33	40.6	33.3	3.64	3.45
T_5	B_1N_1	17.10	13.41	41.6	33.3	4.75	4.76
T_6	B_1N_2	13.89	12.13	42.6	33.3	4.38	3.49
T_7	B_2N_0	14.67	13.55	41.3	37.0	4.38	3.78
T_8	B_2N_1	19.45	14.44	44.0	40.6	5.41	3.83
T_9	B_2N_2	16.03	14.63	44.0	42.3	6.68	2.78
T_{10}	B_3N_0	14.42	15.40	41.0	38.6	4.71	3.64
T_{11}	B_3N_1	15.53	15.33	44.3	42.6	4.66	1.97
T_{12}	B_3N_2	14.50	14.98	44.6	40.6	3.31	5.00
CD at 5%		**17.83**	**20.58**	**0.301**	**0.188**	**0.348**	**0.218**

Table 2: Showing the effect of different Levels of Bioneema and Nitrogenous Fertilizer (Urea) on drymatter No. of Fruits and Fruits Yield.

Treatment		N Uptake (%)		Protein (%)		P Uptake mg/100 mg		Mg Content in Plant Mg/100 g		Fe Content mg/100g	
T_1	B_0N_0	0.106	0.101	0.590	0.453	130.33	148.33	111.75	119.72	16.35	18.22
T_2	B_0N_1	0.125	0.112	0.715	0.601	137.00	167.66	128.13	130.67	12.98	20.04
T_3	B_0N_2	0.195	0.172	1.007	1.010	157.33	178.66	123.85	127.12	19.46	24.33
T_4	B_1N_0	0.196	0.163	1.376	0.923	082.33	154.33	130.65	137.53	20.13	25.56
T_5	B_1N_1	0.157	0.151	0.786	1.039	104.00	172.33	129.28	150.72	21.41	26.14
T_6	B_1N_2	0.134	0.172	0.744	0.801	106.33	191.0	133.51	149.33	25.30	31.26
T_7	B_2N_0	0.195	0.132	0.689	1.090	127.66	157.00	129.56	135.92	20.56	21.54
T_8	B_2N_1	0.214	0.190	1.070	0.974	113.00	166.66	130.29	171.88	22.60	22.46
T_9	B_2N_2	0.145	0.209	1.220	0.786	146.33	196.33	129.87	165.14	24.62	28.30
T_{10}	B_3N_0	0.131	0.140	0.745	1.096	119.66	166.33	128.35	158.64	19.63	21.49
T_{11}	B_3N_1	0.128	0.146	0.716	0.736	130.33	166.66	133.82	152.21	21.34	25.83
T_{12}	B_3N_2	0.133	0.139	0.588	0.931	131.66	185.00	130.28	183.64	20.43	23.67
CD at 5%		**1.53**	**1.54**	**2.67**	**2.86**	**1.56**	**1.59**	**2.16**	**1.86**	**3.56**	**3.27**

Table 3: N, Protein (%) P, Mg and iron uptake as Affected by varying levels of Neem Product (Bioneema) and Nitrogenous fertilizer (Urea) in two successive years

REFERENCES

[1.] Anonymous (2011), Indian Horticulture Database National Horticulture Board, Ministry of Agriculture, Govt. of India.
[2.] Das, B. K. and Padhi N. N. (1991) Response of root knot nematode infecting tomato to seed treatment by some Neem product Orissa, Journal of Agriculture Research 148-150
[3.] Das, R.C. and Patro, R.S. (1990) Effect of Micro Nutrients mixture and urea on growth yield and quality of tomato, Orissa Journal of Hort. 17, 1-2, 37-45.
[4.] Dostal, H.C. and Wilcox. G.E. (1971) Chemical regulation of fruit quality, growth and yield of tomato. Journal American Society, Hort. Sci. 96(5), 668
[5.] Davis, T. H. and Winsor G.W. (1967) Effect of NP and Mg liming on the composition of Tomato fruit Journal Sci. Fd. Agriculture 18: 459-466.
[6.] Fageria, M.S., Chaudhary, B.R. and Dhaka, R.S. (2003) vegetable crops (3rd Ed.) Kalyani Publishers, New Delhi, pp. 25-40.
[7.] Jackson, M.L. (1973), Soil Chemical Analysis Prentise Hall of India Pvt. Ltd., New Delhi, P. 38-474
[8.] Kar, P. L., Long, Kumar, M and Singhal, D (1985) "Effect of Plant growth regulators and their Methods of application on growth, flowering and yield in Tomato cv Pusa Ruby Dwarf. Hort. Journal, 6-1, 45-49.
[9.] Kalloo, G. (1991) Introduction 1: Genetic improvement in tomato (monographs) on theory and applied genetics (1st Ed) 14 springer -verlog, Berlin, pp. 19-26.
[10.] Karu C, Walia, S, Nagal S, Walia S Singh, J. Singh, B.B. -Saha, S. Singh B, Kalia P. Jagi S and Sarika (2013) Functional quality and antioxident composition of selected tomato (Solanum lycopersicon) cultivars grown in Northern Idnia LWT-Food Science and Technology 50 : 139-145.
[11.] Prakash, Rao EVS (1993) Potential use of urea coated with neemcake to improve nutrient uptake of N. recoveries and reduced N losses in perennial Aromatic grass central institute medicinal and aromatics plants (CIMAP) World Neem Conf. Proceedings, Paper No. 90.
[12.] Reddy and Prasad (1977) Neemcake alongwith urea rate Journal Soil Science 26,304-312.
[13.] Sinha, N.P. Singh S.N. and Jha, B. K. (1980) Effect of Neem Cake and its extractives on yield and Nutrients, uptake in rice J. Indian Soc. Soil. Sci. 28, 535-536.