



EFFECT OF INM PRACTICE ON PLANT GROWTH, FRUIT YIELD AND YIELD ATTRIBUTES IN CHILLI (*CAPSICUM ANNUUM L.*)

Vikash Kumar¹, CP Sachan¹, SenjamJinus Singh² and Anjan Kumar Sinha^{3*}

¹Department of Seed Science and Technology, C S Azad University of Agriculture and Technology, Kanpur-208 002, Uttar Pradesh, India

²Department of Vegetable Science, C C S Haryana Agricultural University, Hisar-125004, India

³Department of Botany, BankuraSammilani College, Bankura-722102, West Bengal, India

ABSTRACT: A field experiment was conducted on “Effect of INM practices on plant growth, fruit yield and yield attributes in chilli”. To study the effect of Organic matter, Bio-fertilizers in combination of phytohormones on Growth and yield in chili during Kharif 2010-12 season at student farm of department of vegetable science of college of agriculture (CSAUA and T Kanpur). Application of organic matter @ 25t FYM/ha along with RDF (100:50:50kg NPK/ha) recorded higher plant height (70.6, 86.6, 99.0, 99.7cm. in Azad mirch-1 and 66.8, 72.8, 85.0, 85.9 cm in Chanchal variety) at 60, 90, 120 Days and at harvesting. Similar trend was also noticed in days to 50% Flowering with the application of FYM @ 25t/ha and RDF. The application of FYM @ 25t/ha along with RDF recorded higher no. of fruit (97 and 53/plant) fruit length (7.20 and 3.22cm.), Fruit diameter (2.70 and 2.99), seed weight (0.376 and 0.153g/fruit), pericarp weight (0.270 and 0.222g/Fruit) over control. The fruit yield were also recorded significantly higher (201.99 and 145.32) g/plant in Azad mirch-1 and Chanchal respectively over control.

Key words: Integrated Nutrient Management (INM), Chilli, Bio-fertilizers.

*Corresponding author: Anjan Kumar Sinha, Department of Botany, BankuraSammilani College, Bankura-722102, West Bengal, India E-mail: anjansinha06@gmail.com

Copyright: ©2016 Anjan Kumar Sinha. This is an open-access article distributed under the terms of the Creative Commons Attribution License , which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

INTRODUCTION

Chilli is an important crop used as both green vegetable and spices. It's rich source of Vitamin A, C and E. The pungency in chilli is due to an alkaloid capsaicin. This has high medicinal value specially anti-cancerous and instant pain relief. The world area and production of chilli is around 15 lakh/ha. And 70 lack ton respectively. Major chilli growing countries with their export share are India 25%, China 24%, Spain 17%, Mexico 8%, Pakistan 7.2%, Morocco 7% and Turkey 5%. India, China and Pakistan are major Exporter and consumer of chilli. In India chilli is grown on an area of 7.29 lakh/ha with annual production of 12.69 lakh ton. And productivity of 1530kg/ha. In India major chilli growing states are Andhra Pradesh, Karnataka, UP, Rajasthan, etc. With the indiscriminate use of fertilizers and chemicals there is increased risk of health hazards. Since vegetables are mostly consumed fresh or partially cooked they should be devoid of residues of chemical fertilizers. Besides, continuous use of chemical fertilizers has resulted in the depletion of soil health. For all these reasons, now much importance is being given to Integrated Nutrient Management (INM). Chilli crop respond well to the application of both organic manures and inorganic fertilizers. Organic manures supply the major nutrients minerals and improve many soil properties and soil health that maintain crop productivity. Hence there is an urgent need of use different combination of organics with inorganic along with biofertilizers.

MATERIALS AND METHODS

A field experiment was conducted at the student farm department of vegetable science college of agriculture CSAUA and T Kanpur. The field experiment composed of 14 treatment combination involving two chilli varieties and seven treatments. The design followed was RBD with factorial concept having three replications.

The main field is plough and harrowed till fine tilth. The full dose of FYM, Vermicompost and biofertilizers were incorporated in soil as per the treatment one month before sowing. The entire dose of P_2O_5 , K_2O and half dose of N_2 was applied 30 days before transplanting of seedlings in the field. The seedlings were prepared in nursery and transplanted in main field at $75 \times 45\text{cm}$.

Five plants were selected randomly and tagged in each plot and observations are taken at 60, 90 and 120 DAS and at the time of harvesting. The plant height was measured from the base of the plant to the tip of fully opened leaf on the main shoot and the main plant height measured in cm. For the days to 50% flowering daily observation were made on five randomly selected plants. The days on which 50% of plant showed flowering initiation was carried as 505 flowering and recorded. The yield components were taken as the no. of red fruit harvested from five plants are counted fruit length and diameter of five selected plants was measured from the base of pedicel to the tip of the fruit and average was worked out and expressed in cm.

Pericarp weight of fruit was collected weight and resulted in gram. Fruit yield of five randomly selected plants is taken by picking and drying the harvested fruits and weight as gram/ plant also the fruit yield of whole plant is taken in same way.

RESULTS AND DISCUSSION

The growth parameters (Table 1 and Table 2) differ significantly due to treatment higher plant height (70.6, 86.6, 99.0, 99.7 and 66.8, 72.8, 85.0, 85.9 cm respectively) were noticed with FYM 25 t/ha. Along with RDF in Azad Mirch-1 and Chanchal at 60, 90, 120 days and harvesting respectively which is followed by treatment T_3, T_4, T_5, T_6, T_7 and T_1 Respectively.

These results indicate that the importance of adding organic manures to soil in combination with inorganic fertilizers which increases the availability of nutrients considerably result in positive effect on growth parameters.

Similar findings was also noticed by Damke *et al.* [1] who reported increased plant height /plant in chilli due to compound application of organic, inorganic fertilizers also improves in soil properties. The similar result was also reported by Natrajan [2] and Satagundi [3] in chilli and Rekha and Gopal Krishna [4] in bitter gourd.

Due to treatment there is significant difference in days to 50% flowering. The less no of days to flowering (35.33 and 29.33 day respectively) is noticed in Azad mirch-1 and Chanhal in T_2 (RDF+25 t/ha. FYM) which is followed by T_3, T_4, T_5, T_6, T_7 and T_1 in both the cultivars.

Indication of early flowering due to the application of FYM was mainly ascribed to the process of bio regulators which have an influence on early flowering initiation. These results are in line with the finding of Nirmala and Vedula in Bitter gourd. Another probable reason may be due to better nutritional status of the plant which was favoured by treatments. Increased production of leaves might help to elaborate more photosynthesis and induce flowering stimulates thus effecting early initiation of flower bud.

Due to treatment significant difference in no of fruit /plant was noticed due to treatment and varieties among genotypes. Azad Mirch -1 recorded significantly higher no. of fruit/plant (86.66) over Chanchal (41.23) among treatments. T_2 (RDF+25 t/ha. FYM) recorded significantly higher no of fruit /plant (75.50) followed by T_3 (69.16) and was on par with T_4 while significantly low no. of fruit/plant were recorded in control (54.16). As present study shows increase in no of fruits /plant is due to production of more no. of flowers, higher % of fruit set and reduced shedding of flowers and fruits resulted in increased production. The result of present investigation has conformity with the finding of Maurya and Lal [5] and Balraj [6] in chilli and Goundappalvar [7] in tomato.

Due to introduction of treatments and varieties fruit length significantly differ among genotypes Azad Mirch-1 recorded higher fruit length (6.24cm) over chanchal (2.76 cm). Among treatments T_2 (5.21) followed by T_3 (4.74) and was on par with T_4 (4.56) and T_5 (4.45) while T_1 (4.00) recorded minimum fruit length. But in case of fruit diameter results differ significantly among cultivars Chanchal recorded higher fruit diameter (2.67) over AzadMirch-1 (2.40). While on treatments T_2 (2.84) recorded highest which is followed by T_3 (2.66) and was on par with T_4 (2.07) and T_5 (2.51) while control (T_1) recorded lowest (2.26) increase in fruit length and diameter is attached to increase in the availability of nutrients to the plants with application of the organic manure which in turn enhance the efficiency of N and P. Similar results were reported by Chavan *et al.* [8] and Sutagundi [3] in chilli.

Table 1: Effect of Organics biofertilizers and plant growth regulators on plant height at different growth stages in chilli.

Treatments	Plant Height (cm)											
	60 DAT			90 DAT			120 DAT			At Harvest		
	V1	V2	Mean	V1	V2	Mean	V1	V2	Mean	V1	V2	Mean
T1	56.3	53.0	54.6	72.4	59.1	65.8	77.1	71.0	74.0	78.6	71.7	75.1
T2	70.6	66.8	68.7	86.6	72.8	79.7	99.0	85.0	92.0	99.7	85.9	92.8
T3	66.0	63.1	64.6	81.2	68.1	74.6	90.4	80.5	85.4	91.0	79.7	85.3
T4	65.6	59.6	62.6	76.7	64.9	70.8	87.7	76.3	82.0	88.9	76.4	82.7
T5	63.4	56.0	59.7	76.3	62.3	69.3	86.3	74.6	80.4	86.1	74.7	80.4
T6	60.9	54.3	57.6	74.4	61.1	67.7	81.3	73.8	77.6	81.9	73.9	77.9
T7	59.6	54.0	56.8	73.3	59.3	66.3	79.3	73.3	76.3	80.0	73.4	76.7
Mean	63.2	58.1	60.6	77.3	63.9	70.6	85.8	76.3	81.1	86.6	76.5	81.5
For Comparing the Mean of	S.Em+CD at 5%			S.Em+ CD at 5%			S.Em+ CD at 5%			S.Em+ CD at 5%		
Variety (V)	0.73	2.14		0.92	2.67		1.18	3.43		1.08	3.15	
Treatment(T)	1.38	4.01		1.72	5.00		2.21	6.42		2.03	5.90	
VxT	1.95	NS		2.44	NS		3.12	NS		2.87	NS	

NS - Non significant DAT - Days after Transplanting

V₁ – Azadmirch-1 V₂ – ChanchalT₁ - Control (RDF 100:50:50 kg NPK/ha) T₅ - RDF + Azospirillum (500 g/ha)T₂ - RDF + Farm yard manure(25 t/ha) T₆ - RDF + NAA (40 ppm)T₃ - RDF + Vermicompost (5 t/ha) T₇ - RDF + Ethrel (250 ppm)T₄ - RDF + Vesicular arbuscular mycorrhiza (2 kg /ha)**Table 2: Effect of Organics biofertilizers and plant growth regulators on different parameters in chilli.**

Treatments	Days to 50% Flowering		No. Fruit/Plant		Fruit length(cm)		Fruit Diameter(cm)		Pericarp Weight(g/fruit)		Fruit yield (g/plant)	
	V1	V2	V1	V2	V1	V2	V1	V2	V1	V2	V1	V2
T1	38.66	32.66	72.00	36.33	5.48	2.52	2.20	2.31	0.222	0.191	163.24	122.63
T2	35.33	29.33	97.33	53.66	7.20	3.22	2.70	2.99	0.270	0.222	201.99	145.32
T3	35.66	30.00	93.33	45.00	6.62	2.85	2.56	2.76	0.224	0.214	194.15	139.17
T4	36.66	30.66	89.00	39.66	6.32	2.80	2.43	2.72	0.242	0.220	190.81	132.23
T5	37.33	30.66	86.00	40.00	6.19	2.72	2.34	2.69	0.239	0.210	182.12	130.12
T6	38.00	32.00	84.00	38.00	5.99	2.66	2.31	2.66	0.236	0.209	179.15	123.10
T7	38.33	31.66	85.00	36.00	5.89	2.52	2.25	2.62	0.236	0.208	169.21	127.57
Mean	37.14	31.00	86.66	41.23	6.24	2.74	1.64	2.67	0.241	0.210	183.00	131.45
For Comparing the Mean of	S.Em+ CD at 5%		S.Em+ CD at 5%		S.Em+ CD at 5%		S.Em+ CD at 5%		For Comparing the Mean of		S.Em+ CD at 5%	
Variety (V)	0.30	0.62	1.14	2.36	0.05	0.16	0.03	0.07	0.002	0.042	2.79	5.75
Treatment(T)	0.16	0.33	2.14	4.41	0.10	0.30	0.06	0.13	0.003	0.007	5.23	10.75
VxT	0.42 (NS)	0.88	3.03 (NS)	6.24	0.14 (NS)	0.42	0.093 (NS)	0.19	0.005 (NS)	0.11	7.36 (NS)	15.20

NS - Non significant DAT - Days after Transplanting

V₁ – Azadmirch-1 V₂ – ChanchalT₁ - Control (RDF 100:50:50 kg NPK/ha) T₅ - RDF + Azospirillum (500 g/ha)T₂ - RDF + Farm yard manure(25 t/ha) T₆ - RDF + NAA (40 ppm)T₃ - RDF + Vermicompost (5 t/ha) T₇ - RDF + Ethrel (250 ppm)T₄ - RDF + Vesicular arbuscular mycorrhiza (2 kg /ha)

Significant difference in pericarp weight/fruit is noticed due to treatments and varieties. Among the genotypes Azad mirch-1 recorded significantly higher pericarp weight/fruit (0.241g) over Chanchal (0.210g). Among treatments, T₂ (0.245g) recorded significantly higher pericarp weight/fruit followed by T₃ (0.231g) while lowest weight of pericarp is found in control (0.207g).

Fruit yield g/plant varies significantly due to interaction of genotypes and treatments. Among genotypes AzadMirch-1 recorded higher (183.00 g/plant) over Chanchal (131.45g/plant). Among treatments T2 recorded higher (173.65g/plant) followed by T3 (166.66 g/plant) and T4 (166.66g/plant) while control recorded lowest (142.33g/plant) yield. Similarly fruit yield/ha./varieties significantly differ due to treatment and varieties. Among varieties Azad Mirch-1 recorded significantly higher fresh fruit yield (9050 kg/ha) over Chanchal (6612 kg/ha). Among treatments T2 recorded highest fresh fruit yield (8555kg/ha) followed by T3 (8238kg/ha) and T4 (8038kg/ha.) whereas control recorded lowest (7145kg/hac).This may be due to the better stem girth would have helped the translocation of synthesized cytokines as well as more quantity of available phosphorus through xylem vessels. The accumulation of cytokinins and phosphorus in these auxiliary buds would have favoured the plants to enter in to reproductive phase early.

REFERENCES

- [1] Damke, M.M., Kawarkhe,V. J.and patil,C.O., 1988,Effectofphosphorus and potassium on growth and yield Of chilli. Punjabrao Krishi Vidyapeeth Research Journal, 12: 110-114.
- [2] Natarajan, S., 1990, Standardisation of nitrogen application for chilli (*Capsicum annuum L.*) growth under semi-dry condition. South Indian Horticulture, 47(1-6): 252-254.
- [3] Sutagundi, R. B., 2000, Effect of mulches and nutrient management on growth and yield of chilli (*Capsicumannuum L.*).M.Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad.
- [4] Rekha, C. R. and Gopalakrishnan, J. R., 2001, Effect of levels and frequencies of organic manures and inorganic fertilizers on growth and productivity of bitter gourd (*Mamordicacharantia L.*). South Indian Horticulture, 49: 137-139.
- [5] Maurya, C. P. and Lal, H., 1987, Effect of IAA, NAA and GA on growth and yield of onion (*Allium cepa L.*) and vegetable chilli (*Capsicumannuum L.*).Progressive Horticulture, 19: 203-206.
- [6] Balaraja. R., 2008, Investigations of seed technological aspects in chilli (*Capsicum annuum L*) Ph.D. Thesis, University of Agricultural Sciences, Dharwad
- [7] Goudappalavar, H. B., 2006, Effect of mother plant nutrition and chemical spray on seed yield and quality in tomato (*Lycopersiconesculentum Mill.*). M.Sc. (Agri) Thesis, University of Agricultural Sciences, Dharwad.
- [8] Chavan, P. J., Syed Ismail, Rudraksha, G. B., Malewar, G. V. and baig, M. I., 1997, Effect of various nitrogen levels through FYM and urea on yield, uptake of nutrients and ascorbic acid content in chilli (*Capsicum annuum L.*). Journal of the Indian Society of Soil Science, 45(4): 833-835.

International Journal of Plant, Animal and Environmental Sciences

