International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2021; SP-9(1): 147-149

Received: 21-11-2020
Accepted: 24-12-2020

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Impact of integrated nutrient management on growth and quality in chilli (*Capsicum* annum. var. Ankita N.S-015)

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DOI: https://doi.org/10.22271/chemi.2021.v9.i1c.11553

Abstract
The present research work on evaluation Effect of Integrated Nutrient Management in Chilli (*Capsicum* annum. Var. Ankita N.S-015).
Global awareness of human & soil health and environmental issues has attracted the vegetable growers to adopt alternate farm practices. Therefore, an experiment was conducted at Agricultural Research Farm, Faculty of Agricultural Science & Allied Industries, Rama University, Mandhana, Kanpur (U.P.) during Rabi, 2019-2020. The test crop chilli (var. Anlita N.S-015) received 7 different treatments namely; absolute control (T0), 100% RDF of NPK (T1), 100% RDF of NPK + Azospirillum (T2), 100% RDF of NPK + PSB (T3), 50% RDF of NPK + Azospirillum + PSB (T4), 50% RDF of N + 100% RDF of PK + Azospirillum + PSB (T5), 50% RDF of P + 100% RDF of NK + Azospirillum + PSB (T6). Each treatment was replicated three times and imposed over a statistically laid out field in randomized block design (RBD) at a plot size of 3m × 3m with 3 replications and total no. of plots 21. Ankita N.S-015 variety of chilli was transplanted at a spacing of 60cm x 30cm. Results revealed that the treatment T2 (100% RDF of NPK + Azospirillum) recorded maximum values for plant height (74.250 cm), number of primary brunches (8.100), number of secondary brunches (8.090), Number of Tertiary branches (5.480), Days to Anthesis (45.450), Days to Flowering (54.600). The maximum uptake of Nitrogen, Phosphorous and potassium was also observed in treatment T2 followed by T3 and T1. The results indicated that soil test based recommended dose of fertilizer (50%) combined with Azospirillum + PSB was the best treatment for getting higher yield and return from.

Keywords: NPK, Azospirillum, PSB, Chilli

Introduction

Chilli (*Capsicum annuum* L.) is one of the important vegetable-cum-spice crops of India. It belonging to family Solonaceae having chromosome no 2n=24. It has different types of protein, vitamin, and ascorbic acid contents and is a good source of medicinal potential. The crop is very important for agricultural economy and is used in processing industries. India is the largest producer, consumer and exporter of chilli, which con-tribute to 25% of total world's production. In India, chilli is grown in almost all the states across the length and breadth of the country. In India the most important chilli growing states are Karnataka, Tamil Nadu, Orissa, Maharashtra, Rajasthan and West Bengal. Andhra Pradesh is the largest producer of chilli in India, contributes about 30% to the total area under chilli, followed by Karnataka (20%), Maharashtra (15%), Orissa (9%), Tamil Nadu (8%) and other states contributing 18% to the total area under chilli (Kumar, 2013). It is pre-dominantly popular for its green pungent fruits, which is used for culinary purpose. Chilli production has to be increased primarily from enhancing the productivity with a combination of high yielding plant types (Paul *et al*., 2013), standard agronomic practices like seed priming (Maiti *et al*., 2013) and balanced plant nutrition attained through integrated nutrient management (INM). Since chemical fertilizer alone will not be able to sustain the productivity, integrated use of all potential sources of plant nutrients seems to be the only option to maintain soil fertility and crop productivity.

Materials and Methods

The experiment was conducted at Research Farm, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur in year September 2019 to March 2020 in three consecutive Rabi season. The experiment was laid out in randomized block design (RBD) in three replications with 7 treatments. The variety Ankita N.S-015 has been developed at Chandra Shekhar Azad University of Agricultural & Tech. (Kanpur). The experiment was started on 29th September, 2019. Nursery was raised under low cost polyhouse. The experiment was conducted in plots of size 3.2 x 3.4cm with a spacing of 60 x 30cm. The details of the treatment are T1: control, T2: 100% RDF of NPK, T3: 100% RDF of NPK + Azospirillum, T4: 100% RDF of NPK + PSB, T5: 50% RDF of NPK + Azospirillum + PSB, T 6: 50% RDF of N + 100% RDF of PK + Azospirillum + PSB, T7: 50% RDF of P + 100% RDF of NK + Azospirillum + PSB. The observation were taken on different growth parameters, quality parametars, and yield and yield attributing characters like plant height (cm), number of branches/plant, First flower initiation (Days), First fruit harvest (Days), number of fruits per plant, Total Soluble Solids (TSS) ºBrix, Vitamin C, Number of fruits, Yield per plot, Green pods yield, Number of green pods.

Results and Discussion

Growth contributing parameters

The growth parameters of chilli were significantly influenced by different nutrient management practices and biofertilizers amendments at all the growth parameters are presented in the (Table 1). Significabtly higher plant height (74.250 cm) was recorded in the plants which supplied with 100% RDF of NPK + Azospirillum (T3) and it was on par with T1 (70.880cm), T6 (68.470cm), T5 (68.470 cm). Whereas lower plant height was recorded in T1 (60.650cm). The results of present investigation are in close conformity with the findings of (Deshpande *et al*., 2010) [7].

The application of 100% RDF of NPK + Azospirillum (T3) resulted in significantly higher number of primary, secondary, Tertiary branches per plant (8.100, 8.090 and 5.480). Whereas lower number of primary, secondary and Teatiary branches per plant ware recorded in T1 (5.750, 5.750 and 3.850). The findings are in line with the results of Medhe *et al.,* (2010) [5], Deshpande *et al.*, (2010) [7].

Days of first flower initiation for chilli cultivars showed a significant variation. The maximum days of first flowering T2 (51.600days) which was statistically identical with T3 (51.850 days), while late from T0 (49.900 days) (Table 1.).

Table 1: Days of first flower initiation for chilli cultivars showed a significant variation

Treatments	Plant height	No. of primary branches	No. of secondary branches	No. of tertiary branches	Days to anthesis	Days to flowering per plant
Control	60.650	5.750	5.750	3.850	41.200	49.900
100%. RDF of NPK	70.880	7.750	7.740	5.300	43.100	52.200
100% RDF of NPK + Azospirillum	74.250	8.100	8.090	5.480	45.450	54.600
100% RDF of NPK + PSB	69.170	7.550	7.560	5.100	42.800	51.850
50% RDF of NPK + Azospirillum + PSB	64.100	6.990	6.980	4.620	41.850	50.700
50% RDF of N + 100% RDF of PK + Azospirillum + PSB	68.470	7.450	7.450	5.000	42.950	52.100
500% RDF of P + 100% RDF of Nk + Azospirillum + PSB	63.870	6.950	6.940	4.660	41.800	50.600
C.D.	5.7822	0.8192	1.1156	0.5267	1.9907	2.2811
SE(m)	1.8769	0.2658	0.3619	0.1713	0.6463	0.7405
SE(d)	2.6539	0.3759	0.5118	0.2422	0.9138	1.0471

Quality parameter

The findings of the experiment indicated beneficial effect of integrating NPK fertilization with various organic manures as well as biofertilizers on quality attributing characters of chilli. Quality of chilli is generally evaluated in terms of TSS and vitamin C (Table. 2). It is observed that combination treatment of 100% RDF of NPK + Azospirillum significantly increased the TSS (5.950 ºBrix) and Vitamin C (129.750mg). Similar findings were also reported by Mahmood and Amara (2000) [4] who found that biofertilizers application combined with 50% RDF gave the highest TSS and vitamin C content as well as nutrient content of fruit. Rofi *et al.*, (2002) [8], Chumyani *et al.*, (2012) [1] observed that application of 50% NPK + 50% FYM + Biofertilizers recorded maximum TSS and vitamin C in radish and tomato. Vimera *et al.*, (2010) also reported maximum vitamin C (117 mg/100g) by the application of 50% NPK + 50% FYM + Biofertilizers in king chilli.

Table 2: Quality of chilli is generally evaluated in terms of TSS and vitamin C

Treatments	TSS^0 Brix	Vitamin C
Control	4.930	116.100
100%. RDF of NPK	5.600	131.870
100% RDF of NPK + Azospirillum	5.950	129.750
100% RDF of NPK + PSB	5.510	119.160
50% RDF of NPK + Azospirillum + PSB	5.060	126.690
50% RDF of N + 100% RDF of PK + Azospirillum + PSB	5.380	118.920
50% RDF of P + 100% RDF of Nk + Azospirillum + PSB	5.050	0.000
C.D.	0.2017	6.7233
SE(m)	0.0658	2.1824
SE(d)	0.0931	3.0859

Yield and yield attributes

The findings of the experiment indicated beneficial effect of integrating NPK fertilization with various organic manures as well as biofertilizers on yield and yield attributing characters of chilli (Table.3). Application of 100% RDF of NPK + Azospirillum maximum result in all yield attributing characters such as number of green pods (7.830), green pods yield (201.650). The average number of pods per plant is an important yield component to achieve high green chilli yield.

The average number of pods per chilli plants that were grown in different inorganic and organic fertilizer combinations were increased at 150 DAT rhan those at 120DAT. However, it did not show any significant different (p>0.01) with T5 where the average numbers of 10.5 pods per plants were observe at 120 DAT. This result in conformity with [Kendaragama, 1999] who observed similar results in response of tomato and chilli to application of organic materials.

Table 3: The findings of the experiment indicated beneficial effect of integrating NPK fertilization with various organic manures as well as biofertilizers on yield and yield attributing characters of chilli

Treatments	No. of green pods	Green pods yield
Control	5.110	165.450
100%. RDF of NPK	7.180	187.900
100% RDF of NPK + Azospirillum	7.830	201.650
100% RDF of NPK + PSB	7.070	185.080
50% RDF of NPK + Azospirillum + PSB	6.490	169.940
50% RDF of N + 100% RDF of PK + Azospirillum + PSB	6.900	180.600
50% RDF of P + 100% RDF of Nk + Azospirillum + PSB	6.470	169.380
C.D.	1.1527	17.3029
SE(m)	0.3742	5.6165
SE(d)	0.5291	7.9418

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