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Influence of Secondary Nutrients and Biofertilizers on Postharvest Parameters in *Chilli (Capsicum annuum* L.)

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ABSTRACT: A field experiment was conducted on influence of secondary nutrients and biofertilizers on postharvest parameters in chilli at College of Horticulture, Mudigere. The major postharvest parameters like physiological loss in weight, rotting percent and shelf life in chilli was studied. Chilli commonly encounter postharvest problems, such as quality degradation, chilling injury when stored below 7 °C, shrivelling associated with rapid loss of weight, begin to turn colour and deteriorate within a few days after harvest in ambient conditions. The lowest physiological loss in weight (1.30 %, 2.17 %, 4.05 % and 6.83 %, respectively) @ 4, 8, 12 and 16 DAS, respectively, rotting percent (1.87 %, 4.34 %, 6.90 % and 11.97 %, respectively) @ 4, 8, 12 and 16 DAS, respectively, maximum days of storage life (16.18 days) were noticed with the application of 75 % RDNPK + $CaNO_3$ @ 0.5 % + $MgSO_4$ @ 0.4 % + *Azospirillum* + PSB + KSB (T_{11}). Thus, combined use of organic amendments (biofertilizers, FYM) along with chemical fertilizers not only produced highest and sustainable crop yield but also improved the postharvest parameters due to application of calcium and magnesium to chilli.

Keywords: Chilli, secondary nutrients, post-harvest parameters.

INTRODUCTION

Chilli (*Capsicum annuum* L.) is one of the important commercial crops of India. It is a crop of tropical and sub-tropical regions and requires a warm humid climate. Though, chilli can be grown in many types of soils, well-drained loamy soils rich in organic matter are the best suited for its cultivation. Chilli is a non-climacteric fruit, deterioration is fast during post harvest handling and storage which lead to huge loss. Main post harvest losses are due to quality degradation, chilling injury at temperature below 7°C, shrivelling associated with rapid loss of weight, begin to turn colour and deteriorate within a few days after harvest in ambient conditions (Nyanjage *et al*., 2005; Edusei *et al.*, 2012) and get susceptible to bacterial soft rot while stored above 13°C (Lim *et al*., 2007). Chillies can be normally stored room conditions (27±5 °C and 80-85 % RH) upto 6-8 days. The storage life can be extended by calcium and magnesium application as both the nutrients enhance the shelf life. Calcium ion seemed to be a key player in the modulation of the ripening process while Magnesium could rather play an important role in the regulation of the senescence as reported by Jean and Valere (2010).

MATERIAL AND METHODS

To study the effect of secondary nutrients and biofertilizers on growth, yield and quality of chilli (*Capsicum annuum* L.) under hill zone of Karnataka. 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 eleven treatments and three replications. The seedlings were sown 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- RDF
T_2 -RDF + $CaNO_3$@ 0.5%
T_3 -RDF + $MgSO_4$ @ 0.4%
T_4 -RDF + $CaNO_3$ @ 0.5% + $MgSO_4$ @ 0.4%
T_5 -RDPK + 75 % N + $CaNO_3$ @ 0.5% + *Azospirillum*
T_6 -RDPK + 75 % N +$MgSO_4$ @ 0.4% + *Azospirillum*
T_7 -RDNK + 75 % P + $CaNO_3$ @ 0.5% + PSB
T_8 -RDNK + 75 % P + $MgSO_4$ @ 0.4 % + PSB
T_9 -RDNP +75 % K + $CaNO_3$ @ 0.5% + KSB
T_{10}- RDNP + 75 % K + $MgSO_4$ @ 0.4% + KSB
T_{11} -75% RDNPK + $CaNO_3$@ 0.5 % + $MgSO_4$ @ 0.4% +*Azospirillum* + PSB + KSB

Well decomposed FYM @ 25 tonnes per hectare was applied at the time of land preparation. The recommended dose 150:75:75 kg NPK per ha was applied in the form of urea, single super phosphate and muriate of potash, respectively. One week after transplanting drenching of biofertilizers was done and two weeks after transplanting secondary nutrients were sprayed as first spray, second spray was done at 15 days after the first spray and at the same time observations on growth, yield and quality parameters were recorded.

The weight of fruits prior to storage and weight after storage were recorded at 4, 8, 12 and 16 days interval and the difference was worked out to estimate the loss in weight. The percent reduction in the initial weight was computed using the formula. The number of fruits that were rotten or shrivelled in storage period were counted in different treatments at various intervals and the per cent was computed. The maximum duration of time beyond which fruits lost its freshness and quality. It was noted as shelf life of fruits.

RESULTS AND DISCUSSION

Physiological loss in weight, rotting per cent and shelf life of chilli fruits were significantly influenced by the effect of secondary nutrients and biofertilizers in chilli (Table 1-3). Minimum physiological loss in weight, 4, 8, 12 and 16 days after storage (1.30 %, 2.17 %, 4.05 % and 6.83 %) was observed in (T_{11}) 75% RDNPK + $CaNO_3$ @ 0.5% + $MgSO_4$@ 0.4% + *Azospirillum* + PSB + KSB which was followed by (T10) (1.45 %, 2.40 %, 4.28 % and 7.06 %). Whereas, maximum physiological loss in weight (2.53 %, 3.98 %, 7.43 % and 9.56 %) was recorded from (T_1) control. Minimum rotting (1.87 %, 4.34 %, 6.90 % and 11.97 %) at 4, 8, 12 and 16 days after storage was observed in (T_{11}) 75% RDNPK + $CaNO_3$ @ 0.5% + $MgSO_4$@ 0.4%+*Azospirillum* + PSB + KSB which was followed by (T10) (2.00 %, 4.97 % 7.09 % and 12.46 %). Whereas, maximum rotting (4.06 %, 9.21 %, 12.21 % and 16.78 %) was recorded from (T_1) control. During storage, the maximum shelf life (16.18 days) was observed in (T_{11}) 75% RDNPK + $CaNO_3$ @ 0.5% + $MgSO_4$@ 0.4%+*Azospirillum* + PSB + KSB which was followed by (T10) (14.77 days). Whereas, minimum shelf life (8.06 days) was recorded from (T_1) Control. Comparison of all the treatments with respect to post-harvest parameters in chilli are depicted in Plate 1.

Treatments showed significant difference in physiological loss in weight. The plants treated with (T_{11}- 75% RDNPK + $CaNO_3$@ 0.5 % + $MgSO_4$ @ 0.4% + *Azospirillum* + PSB + KSB). This might be due to calcium and magnesium increased firmness and texture. Increased firmness reduces the risk of bruising and various forms of discoloration. High Ca:Mg ratios decreased fruit pH, titrable acidity, soluble solids and dry matter as reported by Nanza *et al.* (2006). These results are in line with Bhat *et al.* (2012); Halina *et al.* (2016); Hao and Papadopoulos (2003). Treatments showed significant difference in rotting percent. This might be due to Calcium ion seemed to be a key player in the modulation of the ripening process while Mg could rather play an important role in the regulation of the senescence of tomato fruits as reported by Jean and Valere (2010). These results were also in accordance with the results of Hao and Papadopoulos (2003). Treatments showed significant difference in shelf life. This might be due to the maintenance of firmness which has direct relation with calcium as it interacts with pectic polymers of cell wall and acts as cementing agent which gives strength to the cell wall (Dey and Brinson 2004). Similar results are reported by Jean and Valere (2010). Results were in accordance with the results Henareh *et al.* (2010); Hao and Papadopoulos (2003).

Table 1: Influence of secondary nutrients and biofertilizers on physiological loss in weight (%) in chilli.

Treatments	Physiological loss in weight (%)				
	Initial weight (kg)	4 days	8 days	12 days	16 days
T_1	2	2.53	3.98	7.43	9.56
T_2	2	2.44	3.48	6.95	9.40
T_3	2	2.32	3.20	6.48	9.10
T_4	2	2.18	3.16	6.20	8.67
T_5	2	2.15	3.06	5.82	8.43
T_6	2	1.90	2.97	5.63	8.20
T_7	2	1.76	2.86	5.33	7.85
T_8	2	1.67	2.76	5.02	7.55
T_9	2	1.53	2.54	4.68	7.28
T_{10}	2	1.45	2.40	4.28	7.06
T_{11}	2	1.30	2.17	4.05	6.83
S.Em±		0.02	0.03	0.06	0.07
CD @ (5%)		0.05	0.07	0.17	0.21

Table 2: Influence of secondary nutrients and biofertilizers on rotting (%) in chilli.

Treatments	Rotting (%)				
	Total number of fruits	4 days	8 days	12 days	16 days
T_1	100	4.06	9.21	12.21	16.78
T_2	100	3.92	8.86	11.89	16.26
T_3	100	3.76	8.21	11.23	15.64
T_4	100	3.43	7.95	10.75	15.24
T_5	100	2.98	7.02	9.86	14.86
T_6	100	2.85	6.62	9.04	14.49
T_7	100	2.62	6.02	8.65	14.20
T_8	100	2.27	5.92	8.05	13.95
T_9	100	2.08	5.23	7.76	13.34
T_{10}	100	2.00	4.97	7.09	12.46
T_{11}	100	1.87	4.34	6.90	11.97
S.Em±		0.02	0.06	0.08	0.16
CD @ (5%)		0.07	0.18	0.17	0.45

Table 3: Influence of secondary nutrients and biofertilizers on shelf life (days) in chilli.

Treatments	Shelf life (days)
T_1	8.06
T_2	9.02
T_3	10.00
T_4	10.65
T_5	11.76
T_6	11.96
T_7	12.85
T_8	13.75
T_9	14.43
T_{10}	14.77
T_{11}	16.18
S.Em±	0.11
CD @ (5%)	0.33

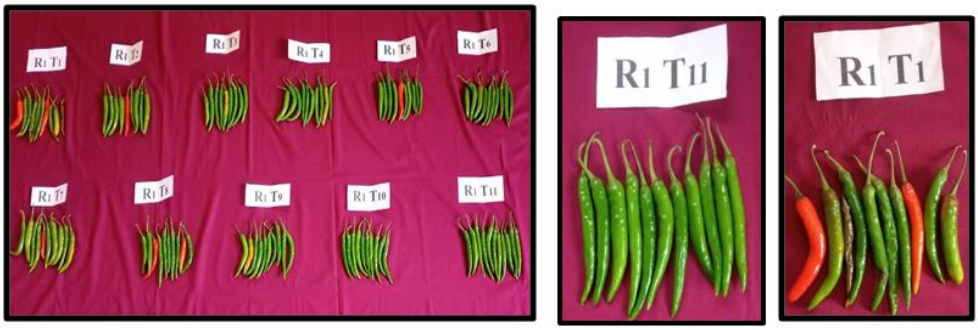

Plate 1. Comparison of all the treatments w.r.t post-harvest parameters in chilli.

CONCLUSIONS

It can be concluded that combined application of 75 % RDNPK + $CaNO_3$@ 0.5 % + $MgSO_4$@ 0.4 % + *Azospirillum* + PSB + KSB (T_{11}) showed the significant variation in physiological loss in weight, rotting per cent and also increased the shelf life of chilli fruits.

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Conflict of Interest. None.

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