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Effect of combined application of inorganic and water soluble fertilizers on growth parameters of chilli hybrid (*Capsicum annuum* L.)

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ABSTRACT : An investigation was conducted to study the combined application of inorganic and water soluble fertilizers on growth parameters of chilli hybrid (*Capsicum annuum* L.) was carried out during 2015-2016 in the Pudukkuraipettai village at Virudhachalam Taluk in Cuddalore district. Foliar feeding of water soluble fertilizer NPK (19:19:19, 18:18:18, 13:40:13) at 0.5 per cent and 1 per cent with 5 sprays each starting from 30 DAT at 15 days interval, along with 100 and 75 per cent recommended dose of NPK (120:80:80 kg ha⁻¹) formed thirteen treatments in chilli hybrid cv. SIERRA. The experimental plots were laid out in Randomized Block Design and replicated thrice. The observations on various growth parameters were recorded and subjected to statistical analysis. The results obtained showed that 100% RDF + WSF 1.0% NPK @ 13:40:13 recorded the highest plant height, number of primary branches, stem girth, number of leaves per plant, leaf area, leaf area index and dry matter production.

KEY WORDS : Chilli, Water soluble fertilizers, Inorganic fertilizers, Growth parameters

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Chillies are also known as capsicum, red pepper and paprika depending upon the species and varieties and the manner in which it is prepared and used. It is also used as an essential condiment in foods for its pungency and red colour. Generally, chilli hybrid are known for their higher yield potential, early maturity, uniform fruit size, attractive and uniform colour of fruits. The increase in yield of chilli hybrid is due to increase in fruit weight and more number of fruits per plant. Chilli hybrid having high yield potential requires uninterrupted supply of nutrients both during vegetative and reproductive phase of growth.

There are a number of factors that are responsible for the translocation of assimilates and metabolites of which, nutrients plays an important role in rapid translocation. The uptake of necessary nutrient elements

becomes difficult for the plant, when the application of fertilizers to the soil leads to formation of certain soil complexes and the applied fertilizers are not fully utilized by the plants. In order to avoid (or) eliminate these situations and to improve the efficiency of the fertilizer, the nutrients are applied through foliage. (Deepadevi and Shanthi, 2009).

Foliar feeding has been widely used and accepted as an essential part of crop production, especially on horticultural crops (Kumar, 2013). NPK fertilizers play a significant role in successful chilli production. Application of N, P and K in different ratio through foliar spray is a modern method of fertilization in the vegetable crops due to nature of heavy feeder of nutrients. Hence, the present investigation was undertaken to study the effect of water soluble fertilizers on growth parameters

in chilli hybrid.

RESEARCH METHODS

A field experiment was carried out at Pudhukuraipettai village of Virudhachalam taluk in Cuddalore district, Tamil Nadu to study the effect of water soluble fertilizers on growth of chilli hybrid 'Sierra. Seeds of chilli hybrid Sierra was sown and raised in protrays (98 cells) and they were maintained under the protected structure (Green house) to get healthy seedlings. The seedlings of forty five days were transplanted in a plot size of 2m x 2m at spacing of 75x 60 cm. The experiment was laid out in Randomized Block Design and replicated thrice. The treatments consisted of application of two levels of inorganic fertilizer (100 % and 75% recommended dose fertilizers @ 120:80:80 kg NPK ha⁻¹). The inorganic fertilizers were applied in the form of urea, superphosphate and muriate of potash as per the treatments. N was applied in 4 split doses, first dose was given as a basal application and the remaining N was given in 3 equal splits, at 30 days interval (30, 60 and 90 DAT). The full dose of phosphorus and potassium were applied as basal application at the time of transplanting.

Water soluble fertilizers *viz.*, NPK at 19:19:19, 18:18:18 and 13:40:13 were given in two concentrations of 0.5 per cent and 1 per cent as five sprays, starting from 30 days after transplanting at 15 days interval at

30, 60, and 90 DAT. The required quantity of manures and fertilizers were applied as per the treatment. Five plants were selected at random from the sampling area and tagged for recording biometrical observation. The observations on various growth parameters *viz.*, plant height, number of primary branches, stem girth, number of leaves per plant, leaf area, leaf area index and dry matter production were recorded and statistically analysed as given by Panse and Sukhatme (1978).

RESEARCH FINDINGS AND DISCUSSION

The results of the present investigation revealed that the highest plant height, number of primary branches, stem girth, number of leaves per plant, leaf area, leaf area index and dry matter production were significantly influenced due to application of two levels of various forms of water soluble fertilizers combined with two different levels of inorganic fertilizers.

The recommended dose of inorganic fertilizer and spraying of water soluble fertilizer exhibited significant influence on all the growth parameters of chilli hybrid 'Sierra. Among the various treatments tested, T₁₃, which received 100 per cent recommended dose fertilizer along with water soluble fertilizer 1.0 per cent (NPK 13:40:13), recorded the highest plant height (88.45cm), number of primary branches (13.25), stem girth (6.50cm), number of leaves (155.20), leaf area (48.50) and dry matter production (DMP) (3.85 plant⁻¹g). The least growth

Table 1 : Influence of water soluble fertilizers on growth parameters in chilli hybrid

Treatments	Plant height (cm)	No. of primary branches	Stem girth (cm)	Number of leaves	Leaf area (cm ²)	Leaf area index	DMP plant ⁻¹ (g)
T ₁ - 120:80:80 kg NPK ha ⁻¹ (Recommended dose of fertilizers - RDF)	41.45	7.53	3.02	61.60	12.10	0.53	2.12
T ₂ - 75% RDF+0.5% (NPK @ 19:19:19)	54.82	7.92	3.13	63.50	14.21	0.58	2.51
T ₃ - 75% RDF+1.0% (NPK @ 19:19:19)	62.46	8.22	4.12	74.40	18.12	0.64	2.96
T ₄ - 75% RDF+0.5% (NPK @ 18:18:18)	55.79	8.01	3.20	81.60	22.15	0.69	2.34
T ₅ - 75% RDF+1.0% (NPK @ 18:18:18)	72.38	9.64	4.84	90.80	25.05	0.86	3.05
T ₆ - 75% RDF+0.5% (NPK @ 13:40:13)	68.54	10.08	5.13	101.80	30.02	0.93	3.32
T ₇ - 75% RDF+1.0% (NPK @ 13:40:13)	69.82	10.12	5.22	111.20	34.10	1.06	3.35
T ₈ - 100% RDF+0.5% (NPK @ 19:19:19)	63.62	9.05	4.15	85.40	22.05	1.11	3.10
T ₉ - 100% RDF+1.0% (NPK @ 19:19:19)	70.51	9.80	5.69	95.20	24.23	0.96	3.23
T ₁₀ - 100% RDF+0.5% (NPK @ 18:18:18)	76.02	11.02	5.95	117.60	40.02	1.17	3.39
T ₁₁ - 100% RDF+1.0% (NPK @ 18:18:18)	75.62	10.40	5.88	108.40	39.00	0.98	3.36
T ₁₂ - 100% RDF+0.5% (NPK @ 13:40:13)	83.21	12.62	6.27	141.40	45.15	1.20	3.60
T ₁₃ - 100% RDF+1.0% (NPK @ 13:40:13)	88.45	13.25	6.50	155.20	48.50	1.24	3.85
S.E.±	2.49	0.29	0.11	6.6	1.60	0.01	0.08
C.D. (P= 0.05)	5.12	0.61	0.20	13.5	3.30	0.04	0.17

parameters were recorded in T₁ which received 75 per cent recommended dose of fertilizer. Similar results on increased growth parameters due to the application of water soluble fertilizers combined with inorganic nutrients were reported by Deepadevi and Shanthi (2009) in chilli and Hebber *et al.* (2004) in tomato.

The increase in plant height due to water soluble fertilizers might be due to the solubility and uniform distribution of nutrients would have increased the plant height in chilli as reported by Krishnamoorthi and Noorjehan hanif (2014). Further, it can be revealed from the present study, the plant height was responsive to added nutrients. The increased plant height in the present study could be due to increased uptake of primary nutrients and fast movements of photosynthates within the plant system. Increase in plant height due to foliar application of nutrients was reported by Ananthi *et al.* (2007) in chilli.

Another reason for increase in plant height in the present study could be due to the foliar application of water soluble fertilizers increased the N uptake of the plant in turn influenced the growth characters. Since, N is the chief constituent of protein, essential for the formation of protoplasm, leading to cell division and cell enlargement. The utilization of applied N in protein synthesis stimulates all enzymatic reaction and by this it increased the plant growth was reported by Bharad *et al.* (2007) in chilli. In the present study application of various levels of inorganic and water soluble fertilizers significantly influenced the number of primary branches. Among the various water soluble fertilizers tested, the more number of primary branches was recorded in T₁₃ (13.25) which received 100% RDF + WSF 1.0% NPK @ 13:40:13. The increase in number of branches was due to higher levels of nutrients supplied through foliar application of water soluble fertilizers at early crop stage could have encouraged more number of auxiliary buds and ultimately resulted in more number of branches. Similar results of better branching with foliar application of nutrients and inorganic fertilizers were reported by Chaurasia *et al.* (2005) in brinjal.

Further, the increase in number of branches was due to higher levels of nutrients supplied through foliar application of water soluble fertilizer at early crop stage could have encouraged more number of auxiliary buds and ultimately resulted in more number of branches. Similar results of better branching with combined application of foliar nutrients and inorganic fertilizers

were reported by Narayanamma *et al.* (2009) in brinjal.

In the present study foliar application of various water soluble fertilizer significantly influenced the stem girth (6.50 cm), number of leaves (155.20) and leaf area (48.50 cm²). The highest values of stem girth and leaf characters were recorded in T₁₃ which received 100 per cent recommended dose of fertilizer + WSF 1.0% NPK @ 13:40:13 and the least was recorded in 100 per cent recommended dose of fertilizers alone (T₁). The reason for increase of leaf characters could be attributed by the solubility and uniform distribution of nutrients from the granules might have increased the nutrient availability in the root zone (Krishnamoorthi and Noorjehan hanif, 2014).

The leaves are major site of photosynthesis and act as a major source for the sink. Generally, the leaf production is determined both by environment and nutrition. Among the nutrients, nitrogen plays an important role in leaf production, being a chief constituent of protein and protoplasm it might have enhanced the chlorophyll content of leaves and cell division, thus, resulting in more number of leaves (Barooah and Ahemed, 1983). Similar results were obtained by foliar application of nutrients by Karpakam *et al.* (2004) and Jilani *et al.* (2008) in brinjal.

The dry matter production is the complete expression of growth and it is considered as a function of leaf area, photosynthetic activity, absorption and utilization of minerals and is greatly influenced by foliar nutrition of water soluble fertilizers. In the present study, the dry matter production was found to be significantly higher in the treatments T₁₃ which received 100% RDF + WSF 1.0% NPK 13:40:13. Similar results on increased dry matter production due to WSF and inorganic fertilizers were also reported by Krishnamoorthi and Noorjehan hanif (2014) in chilli.

The results of the investigation revealed that among the three different forms of water soluble fertilizer used, application of 13:40:13 NPK performed better, followed by water soluble fertilizer 18:18:18 NPK and 19:19:19 NPK performed the least. Among the two levels of inorganic fertilizers application of 120:80:80 kg NPK ha⁻¹ recorded the highest growth parameters in chilli hybrid Sierra.

Conclusion:

Based on the present investigation, among the various sources of water soluble fertilizers and inorganic

fertilizers tested foliar application of 5 sprays of NPK (13:40:13) along with the 100 per cent application of inorganic fertilizer (120:80:80 kg NPK ha⁻¹) recorded the highest growth parameters in chilli hybrid Sierra.

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