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Asawari Jadhav

Department of Soil Science and
Agricultural Chemistry, Dr.
Balasaheb Sawant Konkan
Krishi Vidyapeeth, Dapoli,
Maharashtra, India

NH Khobragade

Department of Soil Science and
Agricultural Chemistry, Dr.
Balasaheb Sawant Konkan
Krishi Vidyapeeth, Dapoli,
Maharashtra, India

Effect of soil and foliar supplementation of nitrogen, boron and salicylic acid on quality of cucumber (*Cucumis sativus* L.) in alfisols of Konkan

Asawari Jadhav and NH KhobragadeDOI: <https://doi.org/10.22271/chemi.2021.v9.i1ah.11593>**Abstract**

The field experiment was conducted to assess the effect of soil and foliar supplementation of nitrogen, boron and salicylic acid either alone or in combinations applied along with the recommended dose of fertilizers (135:60:30 NPK kg ha⁻¹) on quality and nutrient content of cucumber (*Cucumis sativus* L.) in acid Alfisols of Konkan at Research and Education Farm, Department of Agricultural Botany, College of Agriculture, Dr Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri (M.S.) during the Summer season of 2018 in Randomized Block Design (RBD) comprising ten treatment combinations replicated thrice. The results revealed that the quality parameters of cucumber grown in acid Alfisols of Konkan viz., TSS, reducing sugar, total sugar and titratable acidity; nitrogen, phosphorus, potassium and boron content in plants significantly increased and recorded the maximum values due to the application of recommended dose of fertilizer (135:60:30 kg ha⁻¹) + foliar spray of nitrogen through urea (1%) + soil application of boron through borax @ 2 kg ha⁻¹ + foliar spray of salicylic acid (0.2%) along with 15 t ha⁻¹ FYM.

Keywords: Cucumber, boron, quality, nutrient content, Konkan**1. Introduction**

Cucumber (*Cucumis sativus* L.), a native of Asia and Africa, is popular vegetable among cucurbitaceous family. It is grown for its edible tender fruits in almost all over world under tropical and subtropical conditions and in all parts of India for last three thousand years. It is said to be the native of northern India. Nutritionally 100g of edible portion of cucumber contains 96.3 g moisture, 2.5 g carbohydrates, 0.4 g protein, 0.1 g fat, 0.3 g minerals, 10 mg calcium, 0.4 g fiber and traces of vitamin C and iron. The fruits of cucumbers possess various medicinal properties e.g. cooling effect, prevents constipation, checks jaundice and indigestion. Cucumber is one of the quickest maturing vine crops, requiring warm weather throughout growth. The optimum temperature for its growth is in 18 °C and 28 °C. Loam, silt loam and clay loam soils are considered best for getting high yield. Soil pH between 5.5 and 6.7 is favourable for its cultivation.

Nitrogen is also major element of nucleic acid, co-enzyme and it is involved in many metabolic processes viz., cell division, photosynthesis, protein synthesis and expansion of shoot and root growth in plants and has active role during vegetative growth. The possible roles of B include sugar transport, cell wall synthesis, lignification, cell wall structure integrity, carbohydrate metabolism, ribose nucleic acid (RNA) metabolism, respiration, indole acetic acid (IAA) metabolism, phenol metabolism, and as part of the cell membranes (Ahmad *et al.*, 2009) [1].

Salicylic acid (SA; 2-hydroxybenzoic acid) is an endogenous growth regulator of phenolic nature, which is normally produced in plants in very small quantities and participates in the regulation of physiological processes in plants. Exogenous application of SA may influence a range of diverse processes in plants, including stomatal closure, ion uptake and transport, membrane permeability, as well as photosynthetic and growth rates.

The foliar spray of nutrients and plant growth regulators enhance the nutrient uptake. Most plants absorb foliar applied urea rapidly and hydrolyze the urea in the cytosol. As cucumber is one of the important summer sown economic crop of Konkan and foliar fertilization may provide a new approach to improve cucumber quality and productivity and such no work on

Corresponding Author:**Asawari Jadhav**

Department of Soil Science and
Agricultural Chemistry, Dr.
Balasaheb Sawant Konkan
Krishi Vidyapeeth, Dapoli,
Maharashtra, India

foliar application has been done on summer grown cucumber in lateritic soils of Konkan, the present study on effect of foliar supplementation of nitrogen, boron and salicylic acid on quality of cucumber (*Cucumis sativus* L.) in acid Alfisols of Konkan is proposed to be undertaken.

2. Material and Methods

The experiment was conducted at Department of Agricultural Botany, College of Agriculture; Dapoli (17° 45' N latitude and 73° 11' E longitude) in Randomized Block Design with ten treatments and replicated thrice on lateritic soil, which is a member of fine, mixed, isohyperthermic family of Fluventic Ustropepts (Bhattacharjee *et al.*, 1978) [2]. The soil was moderately acidic in reaction and having normal electrical conductivity, moderately high in organic carbon, low in available nitrogen and very low and very high in available phosphorus and available potassium, respectively. The Cucumber cv. Sheetal was sown by dibbling method with spacing of 4.0 m x 3.0 m.

The treatment comprised *viz* T₁-Absolute control, T₂-135:60:30 kg N:P₂O₅:K₂O only, T₃ RDF+ Foliar spray of Nitrogen through Urea @ 1%, T₄RDF + Foliar spray of Boron through Boric acid @ 0.5%, T₅RDF+ Soil application of Boron through Borax @ 2 kg ha⁻¹, T₆ RDF + Foliar spray of Salicylic acid @ 0.2%, T₇RDF + Foliar spray of boron @ 0.5% + Foliar spray of Salicylic acid @ 0.2%, T₈RDF + Foliar spray of Nitrogen @1% + Foliar spray of Boron @ 0.5% + Foliar spray of Salicylic acid @ 0.2%, T₉RDF + Foliar spray of Nitrogen through Urea @ 0.1% + Soil application of Boron @ 2 kg ha⁻¹ + Foliar Spray of Salicylic acid @ 0.2%, T₁₀ RDF + Foliar boron through Amrashakti @ 2%. After the preparation of plots, FYM was added @ 15 t ha⁻¹ as common to all treatments except control. Nitrogen @ 135 kg ha⁻¹ was applied in two splits *viz.*, first dose of 50 per cent N before sowing and second dose of 50 per cent at 30 days after sowing in the pertinent treatments. Phosphorus @ 60 and potassium @ 30 kg ha⁻¹ were applied in a single dose before the time of sowing in the pertinent treatments. For foliar

application, nitrogen through urea @ 1%, boron through boric acid @ 0.5%, salicylic acid @ 0.2% and Amrashakti @ 0.2% solutions for foliar application were prepared by dissolving the respective weight of chemical in respective quantity of water by continuous stirring and were applied during early morning using a Knapsack Sprayer at 30 and 60 Days after sowing (DAS).

The treatment wise fresh fruit samples were collected and used for analysis of quality parameters by using methods like total soluble solids- Hand refractometer, reducing sugar- Lane and Eynon (1923) [3], total sugar-Lane and Eynon method (1923) [3] as described by Ranganna (1986) [7], titratable acidity-Ranganna (1985) [6] and moisture % (Ranganna, 1977) [5]. The data obtained were subjected to statistical analysis by following procedure pertinent to randomized block design as given by Panse and Sukhatme (1967) [4].

3. Results and Discussion

3.1 Quality parameters of cucumber

3.1.1 Total soluble solids (T.S.S) °Brix

The data regarding total soluble solids of fruit as influenced by soil and foliar supplementation of nitrogen, boron and salicylic acid and varied from 1.66 to 2.16 °Brix (Table1). Application of recommended dose of fertilizer (135:60:30 kg ha⁻¹) + foliar spray of nitrogen through urea (1%) + soil application of boron through borax @ 2 kg ha⁻¹+ foliar spray of salicylic acid 0.2% (i.e. treatment T₉) recorded the maximum total soluble solids (2.16 °Brix) which was at par with the treatment T₆, T₇ and T₈. Similarly, treatments T₃, T₄, T₅ and T₁₀ were at par with each other. The increase in TSS may be due to combination of nutrients that enhanced the conversion of complex polysaccharides into simple sugar through translocation of sugars from leaves to developing fruits. Several workers have also suggested that foliar feeding of nutrients directly to the site of metabolism as a substitute for or supplement to soil application noticeably improved fruit quality attributes (Samra *et al.*, 1997; Singh *et al.*, 1994) [8, 9].

Table 1: Effect of soil and foliar application of nutrients on quality parameters of plant

Treat. code	Treatments	Moisture %	T.S.S °Brix	Titrable acidity	Reducing sugar	Total sugar
T ₁	Absolute Control (No Fertilizer)	95.75	1.833	0.06	0.76	3.65
T ₂	Recommended Dose of Fertilizer i.e., 135:60:30 NPK kg ha ⁻¹	97.65	1.667	0.11	0.94	2.63
T ₃	RDF+ Foliar spray of Urea (1%)	98.43	2.167	0.17	0.89	3.25
T ₄	RDF+ Foliar spray of Boric acid (0.5%)	98.31	2.000	0.22	0.74	5.54
T ₅	RDF+ Soil application of Borax @ 2 kg ha ⁻¹	98.06	1.933	0.23	0.78	3.65
T ₆	RDF+ Foliar spray of Salicylic acid (0.2%)	98.32	1.900	0.13	0.98	3.36
T ₇	RDF+ Foliar spray of Boric acid (0.5%) + Foliar spray of Salicylic acid (0.2%)	98.21	2.100	0.13	0.75	4.56
T ₈	RDF+ Foliar spray of Urea (1%) + Foliar spray of Boric acid (0.5%) + Foliar spray of Salicylic acid (0.2%)	98.62	1.733	0.12	0.81	2.42
T ₉	RDF+ Foliar spray of Urea (1%) + Soil application of Borax @ 2 kg ha ⁻¹ + Foliar spray of Salicylic acid (0.2%)	98.64	2.067	0.24	0.82	4.79
T ₁₀	RDF+ Amrashakti @ 2%	97.48	1.700	0.13	0.86	2.97
	S.E. +	0.60	0.07	0.03	0.06	0.16
	C.D. (P=0.05)	NS	0.214	0.091	0.197	0.502

3.1.2 Reducing sugar (%)

Reducing sugar of fruit as influenced by the soil and foliar supplementation of nitrogen, boron and salicylic acid varied from 0.724 to 1.053 per cent (Table 1). Application of recommended dose of fertilizer (135:60:30 kg ha⁻¹) + foliar spray of nitrogen through urea (1%) + soil application of boron through borax @ 2 kg ha⁻¹+ foliar spray of salicylic acid (0.2%) (i.e. treatment T₉) recorded the maximum reducing sugar (1.053%) which was significantly superior

over all treatments. In case boron application, the foliar spray of boric acid 0.5% (T₄) recorded the significant higher values compared with the soil application of borax @ 2 kg ha⁻¹ (T₅) indicating thereby the superiority of foliar over the soil application.

3.1.3 Total sugar (%)

Application of recommended dose of fertilizer (135:60:30 kg ha⁻¹) + foliar spray of nitrogen through urea (1%) + soil

application of boron through borax @ 2 kg ha⁻¹ + foliar spray of salicylic acid (0.2%) (i.e. treatment T₉) recorded the maximum total sugar (5.54%) which was significantly superior over rest of the treatments (Table 1). The increase in sugars and different fractions of sugars might be due to nutrient combination augmented the conversion of starch to sugar and it has also been increases transportation of sugars, synthesis of metabolites and rapid translocation of photosynthates and minerals from other parts of the plant to developing fruits.

3.1.4 Titratable Acidity (%)

In case of titratable acidity application of recommended dose of fertilizer (135:60:30 kg ha⁻¹) + foliar spray of nitrogen through urea (1%) + soil application of boron through borax @ 2 kg ha⁻¹ + foliar spray of salicylic acid (0.2%) (i.e. treatment T₉) recorded the highest titratable acidity (0.309%) which was found significantly superior over rest of the treatments (Table 1).

3.1.5 Moisture (%)

Application of RDF alone or in combination with soil and foliar application of nitrogen, boron and salicylic acid (from treatment T₂ to T₁₀) numerically increased the moisture per cent over the control treatment (T₁), but did not reach the level of significance (Table 1).

4. Conclusion

Thus, considering quality of cucumber fruit, application of recommended dose of fertilizer (135:60:30 kg ha⁻¹) + foliar spray of nitrogen through urea (1%) + soil application of boron through borax @ 2 kg ha⁻¹ + foliar spray of salicylic acid (0.2%) was found to be superior and beneficial in lateritic soils of Konkan.

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