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Effect of different organic and inorganic fertilizers on yield, nutrient content and quality of cucumber (*Cucumis sativus* L.) in lateritic soil of Konkan (M.S.)

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Abstract

A field experiment entitled “Effect of different organic and inorganic fertilizers on yield, nutrient content and quality of cucumber (*Cucumis sativus* L.)” laid out in Randomized Block Design comprising thirteen treatment combinations replicated thrice at Department of Horticulture, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri (M.S.) during *kharif* season of 2015. The effect of different inorganic fertilizers and organic manures like FYM, vermicompost and poultry manure either alone or in combinations on yield, nutrient content and quality of cucumber were studied.

The application of 50% RDF through inorganic plus 50% RDN through poultry manure (T₉) shown its significance on the fruit yield, nutrient content in plant, quality of fruit indicates its suitability for cucumber cultivation in lateritic soil of Konkan (M.S.).

Keywords: konkan, lateritic, cucumber, organic, *Cucumis sativus*

Introduction

Cucumber is one of the most important vegetable crop. It has high place in diet. It is a rich source of carbohydrate, vitamins and minerals. It is one of the fastest growing vegetable crop. Tender fruits before maturity are used as salad, pickles as well as cooked vegetable. The cultivation of cucumber in India was practiced before 3000 years (De Candolle, 1882). India is the second largest producer of vegetables in the world, next to China. India producing about 678.15 million tonnes of cucumber from an area of around 43.28 million hectares (Anonymous, 2014) [1]. Cucumber requires heavy supply of plant nutrients especially N, P and K fertilizers for ensuring good plant growth and giving higher yield. The fertilizers are powerful crop management tools and can make effective contribution to crop production only, when all other production factors are in reasonable balance and receive appropriate attention. Number of investigators has shown that there is a definite and nearly constant requirement of NPK for production of high yielding varieties of cucumber.

Intensive cultivation and improper fertilizer use leads to deficiency of nutrients, thus resulting in lower yield of crops. Therefore, the use of farm input in the form of organic manure has become necessary. Number of investigations were undertaken to study the effect of different chemical fertilizers on cucumber in different soils; on the other hand, the use of organic nutrient sources such as FYM, poultry manures, vermicompost *etc.* remains as alternative choice for the production of residue free wholesome produce, and to maintain soil health. The information on holistic approach with suitable combination of organic manure and inorganic fertilizers on yield and quality of cucumber in lateritic soil of Konkan region is very meager. Keeping in view the above facts, the present investigation was undertaken entitled, “Effect of different organic and inorganic fertilizers on yield and quality of cucumber (*Cucumis sativus* L.) in lateritic soil of Konkan (M.S.).”

Materials and Methods

The experiment was conducted at Department of Horticulture, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri during *kharif* season of 2015. The effect of different inorganic fertilizers and organic manures *viz* FYM, vermicompost and poultry manure either alone or in combinations on yield, nutrient content and quality of

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cucumber were studied. The experiment was laid out in Randomized Block Design (RBD) with thirteen treatments replicated thrice. The treatments comprised of four sources of nitrogen *viz.*, urea, FYM, Vermicompost and Poultry manure. The experimental field soil was sandy clay loam in texture, slightly acidic in reaction and having low electrical conductivity, very high in organic carbon, low in available nitrogen, very low in available phosphorus and moderately high in available potassium. In general, soil properties of experimental site showed a typical lateritic soil of Konkan region. Well decomposed FYM, Vermicompost and Poultry manure was applied 15 days before sowing as a broadcast in single dose as per the treatment plan. Nitrogen @ 135 kg ha⁻¹ was applied in three splits doses *viz.*, first dose of 50 per cent N at the time of sowing, second dose of 30 per cent N after 30 days of sowing and remaining 20 per cent dose of N after 60 days of sowing. Phosphorus was applied @ 60 kg ha⁻¹ and Potassium was applied @ 30 kg ha⁻¹. These fertilizers were applied in a single dose at the time of sowing as per treatment

plan. The cucumber crop cv. Sheetal was sown at a spacing 0.6 m x 4.0 m. The plot size was 4.0 x 3.0 m. Weeding and plant protection measure were followed as and when needed. Observations were recorded at different stages of growth periods *viz.* at 30 DAS, 60 DAS and after harvest. For nutrient content in plant samples collected at an interval of 30 DAS, 60 DAS and after harvest of crop by following the standard method. These collected plant samples were processed and analyzed by following the standard analytical methods. The data were statistically analyzed by the method suggested by Panse and Sukhatme (1985) [8].

Results and Discussion

In the present investigation an attempt has been made to study the effect of different organic and inorganic fertilizers on yield, nutrient content and quality of cucumber (*Cucumis sativus* L.) in lateritic soil of Konkan. The results obtained are presented in relevant Tables as follows

Table 1: Effect of different organic and inorganic fertilizers on yield of cucumber (kg ha⁻¹)

Tr. No	Treatment	Yield (kg ha ⁻¹)
T ₁	Absolute control	10309
T ₂	RDF (135:60:30) through inorganic fertilizers	15649
T ₃	50% RDF through inorganic + 50% RDF through FYM	14029
T ₄	80% RDF through inorganic fertilizers	13860
T ₅	80% RDN through FYM	12258
T ₆	Vermicompost (VC) @11 t ha ⁻¹	14274
T ₇	Poultry manure (PM) @4.5 t ha ⁻¹	14697
T ₈	50% RDF through inorganic + 50% RDN through vermicompost	15510
T ₉	50 % RDF through inorganic + 50 % RDN through poultry manure	16512
T ₁₀	50% RDN through FYM + 50% RDN through vermicompost	13943
T ₁₁	50% RDN through FYM + 50% RDN through poultry manure	14704
T ₁₂	80% RDN through vermicompost (VC)	15134
T ₁₃	80% RDN through poultry manure (PM)	15320
mean		14323
S.E. ±		813.26
C.D. (P=0.05)		2373.73

A) Yield (kg ha⁻¹): The effect of different organic and inorganic fertilizer showed a significant effect on the yield of cucumber fruits. The fruit yield of cucumber ranged from 10309 to 16512 kg ha⁻¹ with an average value of 14323 kg ha⁻¹. The treatment (T₉) receiving equal integration of RDF through inorganic + RDN through poultry manure recorded the significantly highest yield of cucumber (16512 kg ha⁻¹), but at par with T₂ (15649 kg ha⁻¹), T₆ (14274 kg ha⁻¹), T₇ (14697 kg ha⁻¹), T₈ (15510 kg ha⁻¹), T₁₁ (15134 kg ha⁻¹), T₁₂ (14704 kg ha⁻¹) and T₁₃ (15320 kg ha⁻¹). It was observed that the treatment T₉ receiving 50% RDF through inorganic plus 50% RDN through poultry manure recorded significantly highest fruit yield of cucumber. This may be due to the presence of more per cent of N in poultry manure than the other two organic manures used i.e. FYM and vermicompost. Kameshwari *et al.* (2011) [5] and Dodake (2015) [4] also reported the highest fruit yield with 50% RDF plus 50% poultry manure in ridge gourd and bitter gourd, respectively.

B) The effect of organic and inorganic fertilizers on nutrient content in cucumber

The data pertaining to the total nitrogen, phosphorus and potassium in cucumber plant as affected by different organic and inorganic fertilizers at 30 DAS, 60 DAS and after harvest are presented in Table 2

Total N, P and K content

Total N content in cucumber at 30 DAS, 60 DAS and after harvest ranged from 1.48 to 2.05%, 1.36 to 1.77% and 1.20 to 1.52% with an average value of 1.85, 1.65 and 1.44%, respectively. The total Phosphorous content varied from 0.26 to 0.39 %, 0.21 to 0.34 % and 0.18 to 0.31% with an average values of 0.35, 0.35 and 0.30 %, respectively and the total potassium content in cucumber showed variation from 1.57 to 2.13%, 1.60 to 2.24% and 1.43 to 1.47% with an mean value of 1.79, 2.06 and 1.60 %, respectively.

Treatment (T₉) receiving 50% RDF through inorganic plus 50% RDN through poultry manure registered higher total nitrogen and phosphorus content at all growth stages *viz.*, 30 DAS, 60 DAS and after harvest and it was decreased with the advancement in growing period of crop. Regarding the highest total potassium content in cucumber was found in the treatments (T₉), (T₆) and (T₉) at 30 DAS, 60 DAS and after harvest, respectively.

In general, total nitrogen, phosphorus and potassium content in cucumber crop observed to be decreasing with advancement of growth period of cucumber crop; it was maximum at 30 DAS followed by at 60 DAS and minimum at harvest. However, total N, P and K content in cucumber crop at all growth stages was found to be sufficient / normal.

Significant increase in N, P and K content in cowpea was reported by Bhikane (2002) [2] with poultry manure in lateritic

soils of Konkan. Narayanamma *et al.* (2009) [7] reported the highest total P content (0.28 %) with application of poultry

manure @ 2.5 t + ½ RDF ha⁻¹ and neem cake @ 1t.

Table 2: Effect of different organic and inorganic fertilizers on nutrient content in cucumber (%)

Treatments	Total nitrogen			Total phosphorus			Total potassium		
	Days After Sowing (DAS)			Days After Sowing (DAS)			Days After Sowing (DAS)		
	30	60	After harvest	30	60	After harvest	30	60	After harvest
T ₁	1.48	1.36	1.20	0.26	0.21	0.18	1.57	1.60	1.43
T ₂	2.00	1.79	1.49	0.36	0.31	0.25	1.83	2.07	1.60
T ₃	1.76	1.65	1.34	0.32	0.27	0.24	1.69	2.11	1.51
T ₄	1.90	1.52	1.37	0.35	0.29	0.27	2.04	2.30	1.68
T ₅	1.72	1.70	1.46	0.30	0.29	0.29	1.71	1.79	1.48
T ₆	1.88	1.58	1.39	0.37	0.31	0.27	1.48	2.31	1.54
T ₇	1.95	1.77	1.52	0.37	0.32	0.29	1.81	1.97	1.47
T ₈	2.03	1.57	1.51	0.35	0.32	0.28	1.59	2.03	1.58
T ₉	2.05	1.91	1.66	0.39	0.34	0.31	2.13	2.24	1.87
T ₁₀	1.96	1.80	1.48	0.38	0.33	0.29	2.10	2.22	1.73
T ₁₁	1.68	1.56	1.35	0.34	0.27	0.27	1.89	2.03	1.55
T ₁₂	1.83	1.56	1.42	0.35	0.30	0.25	1.67	1.85	1.72
T ₁₃	1.85	1.74	1.49	0.36	0.33	0.23	1.68	2.20	1.71
Mean	1.85	1.65	1.44	0.35	0.30	0.26	1.79	2.06	1.61
S.E. ±	0.074	0.042	0.056	0.008	0.008	0.005	0.030	0.030	0.016
C.D. (P=0.05)	0.22	0.12	0.16	0.023	0.024	0.016	0.088	0.089	0.047

C) Effect of different organic and inorganic fertilizer on quality parameters of cucumber

To judge the quality of cucumber following parameter were analyzed at tender stage of cucumber for this purpose tender fruits were collected and analyzed. The data on quality parameter is presented in Table 3.

Moisture per cent

Moisture is one of the quality parameter it showed variation from 93.40 to 94.88 per cent with mean value 94.05 per cent moisture was maximum in treatment (T₁₂) receiving 80 % RDN through vermicompost while minimum moisture content was observed in control treatments (T₁) receiving no fertilizers. Similar findings were also observed by Azmari *et al* (2009) and Kameshwari (2011) [5].

Total soluble salt (°B)

Total soluble salt is also the quality parameter to judge the quality of cucumber. It ranged from 2.5 to 3.4 °B and 3.0 °B was the average value. It was maximum (3.4°B) and minimum (2.5°B) in the treatments (T₆) and (T₁) respectively. Similar finding were also reported Azmari *et al* (2009).

Acidity per cent

Acidity is also used for judging the quality of cucumber. The data on acidity presented in Table 3 indicated that acidity varied between 0.22 to 0.33 per cent and 0.27 per cent was average value of acidity. Integration of 50 % RDF through

inorganic and 50% RDN through poultry manure treatment (T₉) has produced significant effect on acidity over almost all the treatment except T₃, T₅, T₇ and T₁₃. It was maximum in treatment T₉ while minimum in control (T₁). Similar results were also recorded by Cimpeanu *et al* (2013) [13].

Ascorbic acid (mg/100g)

Ascorbic acid varied from 10.08 to 14.94 mg/100g with a mean value of 12.15 mg/100g treatment T₉ receiving of 50 % RDF through inorganic and 50% RDN through poultry manure registered higher value of ascorbic acid (14.94 mg/100g) whereas control treatment (T₁) registered lower ascorbic acid content. Similar finding were also reported by Kameshwari (2011) [5].

Reducing sugar and total sugar per cent

Reducing sugar is one of the quality parameter to judge quality of cucumber. It showed variation from 1.68 to 2.10 per cent and 1.91 per cent was the average value and Total sugar per cent ranges from 2.56 to 3.01 per cent with an average value of 2.81 per cent. A close scrutiny of data indicated that treatment (T₆) with application of vermicompost (VC) 11 t ha⁻¹ had significant influence on reducing sugar content and total sugar percent in cucumber over almost all the treatments with exception of (T₁₀), (T₁₂) and (T₁₃). With increase in reducing sugar content in cucumber enhanced better quality fruits as observed by Kameshwari *et al* (2011) [5].

Table 3: Effect of different organic and inorganic fertilizers on quality parameters of cucumber

Treatments	Moisture (%)	TSS (°B)	Acidity (%)	Ascorbic acid (mg/100 g)	Reducing sugar (%)	Total sugar (%)
T ₁	93.34	2.5	0.22	10.08	1.68	2.56
T ₂	93.39	2.9	0.23	10.94	1.84	2.74
T ₃	93.85	2.9	0.29	12.50	1.76	2.65
T ₄	93.72	2.8	0.24	12.50	1.81	2.79
T ₅	94.31	3.1	0.31	11.10	1.99	2.85
T ₆	94.27	3.4	0.25	14.04	2.10	3.01
T ₇	93.85	3.2	0.32	11.23	1.95	2.99
T ₈	94.92	3.0	0.26	10.29	1.83	2.73
T ₉	93.42	3.2	0.33	14.94	1.89	2.71
T ₁₀	94.40	3.0	0.27	13.11	2.02	2.92
T ₁₁	94.21	3.0	0.26	11.95	1.79	2.69

T ₁₂	94.88	3.2	0.28	11.67	2.09	2.95
T ₁₃	94.07	3.1	0.30	13.54	2.05	2.88
Mean	94.05	3.0	0.27	12.15	1.91	2.81
S.E. \pm	0.17	0.11	0.012	0.61	0.022	0.021
C.D. (P=0.05)	0.51	0.33	0.036	1.79	0.064	0.063

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