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Performance of different leafy vegetables with respect to open field and net house on growth, yield and quality

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Abstract

The present investigation entitled “Performance of different leafy vegetables with respect to open field and net house on growth, yield and quality” was carried out from March to May 2016 at Horticulture Instructional Farm, Department of Horticulture, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. Experiment was laid out in split plot design in which four different vegetables viz., coriander (v₁), fenugreek (v₂), palak (v₃) and amaranth (v₄) were taken in sub plot and sown in two growing conditions i.e. open field (c₁) and 50 per cent agro shade net (green) (c₂) as main plot. Therefore, total eight treatment combinations were replicated thrice. Among two growing conditions, 50 per cent agro shade net (green) performed significantly superior over open field with respect to early germination (5.34 days), maximum plant height (21.69 cm), leaf area (22.05 cm²), minimum days taken for first cutting (30.46), days taken for subsequent cutting (9.89), maximum yield of first cutting (0.75 kg), yield of subsequent cutting (2.77 kg), yield per plot (3.52 kg), maximum yield per hectare (157.14 q), highest iron content (5.40 mg/100g) and carotenoid content (3.81 mg/100g). Among leafy vegetable crops, palak was found significantly superior with respect to plant height (20.54 cm), leaf area (35.02 cm²), minimum days taken for first cutting (30.95), days taken for subsequent cutting (8.41), maximum yield of first cutting (1.06 kg), yield of subsequent cutting (3.38 kg), yield per plot (4.44 kg) and yield per hectare (198.21 q) also maximum chlorophyll a, b & total content (99.62, 61.99, 161.61 mg/100g, respectively) and carotenoid content (5.85 mg/100g). Palak grown under 50 per cent green agro shade net was produced maximum yield (196.9 q) and net return (1:3.71).

Keywords: different leafy vegetable crops, growing condition, yield and quality

Introduction

Coriander (*Coriandrum sativum* L.) is an important seed spice crop of family Apiaceae. The whole plant is aromatic. Fenugreek (*Trigonella foenumgraecum*) is a plant of Fabaceae family and India is one of the major producer and exporter of fenugreek. Rajasthan alone contributes 90 percent of the total national production. Palak (*Beta vulgaris var. bengalensis*) is the most common leafy vegetable of Chenopodiaceae family grown during winter and summer season in India. Amaranth (*Amaranthus* spp.) is a member of Amaranthaceae family widely grown in the tropics. Leafy vegetables are an exceptionally rich source of calcium, iron and vitamin C, a very rich source of potassium, vitamin A and riboflavin, a rich source of niacin and an above average source of protein.

Under open field condition, it is very difficult to grow vegetables successfully in the summer season due to very high incidence of biotic and abiotic factors. By adopting low-cost protected technologies like net house and shade net house are highly suitable for successful cultivation of common and high value vegetables during summer season (Singh *et al.* 2010)^[14].

Material and methods

The present experiment conducted in open field and net house condition at Horticulture Instructional Farm, Department of Horticulture, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar during summer season in the year 2016 in which efforts were made to investigate, “performance of different vegetables with respect to open field and net house on growth, yield and quality”. The soil of experimental plot is loamy sand in texture having pH 7.8, low in organic carbon and available nitrogen, medium in available phosphorus and high in available potash.

The experiment was laid out in Split Plot Design (SPD) with three replications. Total eight treatment combinations were employed in the experiment of two factors *viz.*, first factor growing condition (C) open field, 50 per cent agro shade net green with two levels and second factor different vegetable crops (V) with four levels coriander, fenugreek, palak and amaranth. The growth, yield and quality parameters as chlorophyll a, b, total chlorophyll and carotenoid content by

Sadasivam and Manickam (1997)^[10], and iron content by atomic absorption spectrophotometer reading was recorded with standard techniques. The mean data were subjected to statistical analysis following analysis of variance technique (Panse and Sukhatme, 1985)^[9].

Results and discussion

Table 1: Effect of different growing condition and leafy vegetable crops on growth parameters

Treatments	Days taken for germination	Plant height (cm)	Leaf area (cm ²)	Days taken for first cutting	Days taken for subsequent cutting
Growing conditions (C)					
Open field (c ₁)	6.51	15.92	19.12	33.50	11.57
50% agro shade net green (c ₂)	5.34	21.69	22.05	30.46	9.89
S.Em ±	0.15	0.43	0.48	0.82	0.26
C.D. (at 5 % level)	0.93	2.64	2.90	4.99	1.58
C.V. %	9.02	7.98	8.01	9.18	8.40
Leafy vegetable crops (V)					
Coriander (v ₁)	6.34	15.65	13.43	37.03	12.39
Fenugreek (v ₂)	4.01	18.76	7.41	32.97	12.01
Palak (v ₃)	6.18	20.54	35.02	30.95	8.41
Amaranth (v ₄)	7.18	20.27	26.48	31.97	10.11
S.Em ±	0.17	0.46	0.63	0.91	0.33
C.D. (at 5 % level)	0.52	1.41	1.98	2.81	1.01
Interaction					
S.Em ±	0.24	0.65	0.89	1.29	0.47
C.D. (at 5 % level)	NS	NS	NS	NS	NS
C.V. %	7.01	5.97	7.47	7.20	7.52

Perusal of data presented in Table 1 indicated that days taken for germination, plant height, leaf area, days taken for first cutting and days taken for subsequent cutting was significantly influenced by various growing conditions and vegetable crops, whereas effect of its interaction was not significant.

Significantly minimum days taken for germination (5.34), days taken for first cutting (30.46) and days taken for subsequent cutting (9.89) and maximum plant height (21.69 cm), leaf area (22.05 cm) was recorded in treatment c₂ (50% agro shade net- green) whereas, maximum days taken for germination (6.51), was observed in the treatment c₁ (open field).

Data on varietal performance in respect to days taken for germination, plant height, leaf area, days taken for first cutting, and days taken for subsequent cutting showed significant effect among different vegetable crops. However,

significantly minimum days taken for germination (4.01) was recorded in the treatment v₂ (fenugreek), minimum days taken for first cutting (30.95) and days taken for subsequent cutting (8.41) was recorded in the treatment v₃ (palak). Whereas, maximum days taken for germination (7.18) was observed in the treatment v₄ (amaranth), maximum plant height (20.54 cm) and leaf area (35.02 cm) was recorded in the treatment v₃ (palak).

Data presented in Table 1 showed non significant interaction effect of different growing conditions and vegetable crops on days taken for germination, plant height, leaf area, days taken for first cutting and days taken for subsequent cutting. Present findings are in close accordance with that of Kale *et al.* (1997)^[5] reported that vegetative growth of cucumber in net house was magically high as compared to that in open field and lay supports to the present results with Ganesan (2002)^[4] in tomato and Dixit (2007)^[3] in leafy vegetables.

Table 2: Effect of different growing conditions and vegetable crops on yield parameters.

Treatments	Yield of first cutting per plot (kg)	Yield of subsequent cutting (kg)	Yield (kg/plot)	Yield (q/ha)
Growing conditions (C)				
Open field (c ₁)	0.60	1.78	2.38	106.25
50% agro shade net green (c ₂)	0.75	2.77	3.52	157.14
S.Em ±	0.01	0.06	0.06	0.23
C.D. (at 5 % level)	0.09	0.36	0.42	1.40
C.V. %	7.26	8.96	8.70	8.70
Leafy vegetable crops (V)				
Coriander (v ₁)	0.47	0.82	1.29	57.59
Fenugreek (v ₂)	0.32	0.74	1.06	47.32
Palak (v ₃)	1.06	3.38	4.44	198.21
Amaranth (v ₄)	0.86	3.15	4.01	192.79
S.Em ±	0.02	0.07	0.07	0.24
C.D. (at 5 % level)	0.05	0.21	0.22	0.73
Interaction				
S.Em ±	0.03	0.10	0.10	0.33
C.D. (at 5 % level)	0.08	0.30	0.31	1.03
C.V. %	6.44	7.40	6.32	6.32

Perusal of data presented in Table 2 indicated that significantly maximum yield of first cutting per plot (0.75 kg), yield of subsequent cutting (2.77 kg), yield per plot (3.52 kg) and yield per ha (157.14 q) was observed with treatment c_2 (50% agro shade net green), whereas treatment c_1 (open field) was recorded minimum yield of first cutting per plot (0.60 kg), yield of subsequent cutting (1.78 kg), yield per plot (2.38 kg) and yield per ha (106.25 q).

Significantly highest yield of first cutting per plot (1.06 kg), yield of subsequent cutting (3.38 kg), yield per plot (4.44 kg) and yield per ha (198.21 q) was recorded in the treatment v_3 (palak), whereas lowest yield of first cutting per plot (0.32 kg), yield of subsequent cutting (0.74 kg), yield per plot (1.06 kg) and yield per ha (47.32 q) was recorded with treatment v_2 (fenugreek).

Data presented in Table 2 showed that, interaction effect of different growing conditions and vegetable crops exhibited significant difference for yield of first cutting per plot, yield of subsequent cutting, yield per plot and yield per ha.

Extreme weather conditions under the open field are major limiting factor for achieving higher yield and better quality of vegetables. Under such circumstances, protected cultivation is best option. The results obtained from present study on interaction effect of different vegetable crops with conditions for yield parameters were observed in agreement with statement of Cheema (2010) [1]. The results of present study on yield and yield attributing characters are in the line with the findings of Sealy *et al.* (1990), Devadas *et al.* (1992) [2], Pan *et al.* (1992) [6], Shukla *et al.* (2005) [12], Panchbhai *et al.* (2008) [7] and Varalakshmi *et al.* (2011) [15] in different vegetable crops.

Table 3: Effect of different growing conditions and vegetable crops on quality parameters

Treatments	Chlorophyll-a (mg/100g)	Chlorophyll-b (mg/100g)	Total chlorophyll content (mg/100g)	Iron content (mg/100g)	Carotenoid content (mg/100g)
Growing conditions (C)					
Open field (c_1)	40.83	23.95	64.78	4.75	3.18
50% agro shade net green (c_2)	35.29	21.31	56.60	5.40	3.81
S.Em \pm	0.90	0.43	1.56	0.11	0.10
C.D. (at 5 % level)	5.47	2.59	9.51	0.64	0.62
C.V. %	8.18	6.52	9.02	7.24	10.18
Leafy vegetable crops (V)					
Coriander (v_1)	19.54	11.59	31.13	6.68	5.19
Fenugreek (v_2)	17.41	11.65	29.06	2.42	0.43
Palak (v_3)	99.62	61.99	161.61	2.44	5.85
Amaranth (v_4)	15.67	5.28	20.95	8.76	2.50
S.Em \pm	1.10	0.56	1.86	0.13	0.11
C.D. (at 5 % level)	3.38	1.74	5.74	0.41	0.34
Interaction					
S.Em \pm	1.55	0.80	2.63	0.19	0.16
C.D. (at 5 % level)	NS	NS	NS	NS	NS
C.V. %	7.06	6.10	7.60	6.44	7.69

Significant influences of growing conditions and vegetable crops on chlorophyll a, b and total content, iron content and carotenoid content are presented in Table 3. Data showed significant variation for chlorophyll a, b and total content among different growing conditions. Significantly maximum chlorophyll a, b and total content (40.83, 23.95, 64.78 mg/100g, respectively) was recorded with treatment c_2 (50% agro shade net-green), whereas, significantly lowest chlorophyll a, b and total content (35.29, 21.31 and 56.60 mg/100g, respectively) was recorded under treatment c_1 (open field).

Significantly maximum chlorophyll a, b and total content (99.62, 61.99 and 161.61 mg/100g respectively), carotenoid content (5.85 mg/100g) was recorded in treatment v_3 (palak) and iron content 8.76 mg/100g in treatment v_1 (coriander). Whereas, minimum chlorophyll a, b and total content (15.67,

5.28 and 20.95 mg/100g respectively), iron content (2.42 mg/100g) was recorded in treatment v_4 (amaranth) and carotenoid content (0.43 mg/100g) in treatment v_1 (fenugreek).

The interaction between growing conditions and vegetable crops was found not significant with respect to chlorophyll a, b and total content, iron content and carotenoid content.

Like other parameters, quality characters also governed by heredity or genetic constitution of plant. Hence, variation in different vegetables crop is obvious. The results of these quality characters are in conformity with results of Sealy (1990), Devadas *et al.* (1992) [2], Shukla *et al.* (2005) [12], Panchbhai *et al.* (2008) [7] and Varalakshmi *et al.* (2011) [15] in different vegetable crops. Pandey *et al.* 2005 [8] in capsicum and Singh *et al.* (2005) [13] in tomato.

Table 4: Economics

Treatment combinations	Yield (g ha ⁻¹)	Gross returns (₹ ha ⁻¹)	Cost of cultivation (₹ ha ⁻¹)	Net returns (₹ ha ⁻¹)	C:B ratio
c_1v_1	20.4	61200	37320	23880	1:1.63
c_1v_2	26.5	106000	37320	68680	1:2.84
c_1v_3	119.9	131890	38520	93370	1:3.42
c_1v_4	113.7	113700	34720	78980	1:3.27
c_2v_1	65.2	195600	57090	138510	1:3.42
c_2v_2	43.8	175200	57090	118110	1:3.06
c_2v_3	196.9	216590	58290	158300	1:3.71
c_2v_4	170.2	170200	54490	115710	1:3.12

Data regarding economics *i.e.* cost of cultivation, gross return, net return and Cost: benefit ratio are presented in Table 4. Data indicated that, treatment c_2v_3 (palak 50% agro shade net green condition) recorded maximum gross return (₹ 2,16,590), net return (₹ 1,58,300) and cost: benefit ratio (1:3.71). Under open field condition minimum gross return (₹ 61,200) net return (₹ 23,880) and cost: benefit ratio of (1:1.63) was obtained in coriander.

After close evaluation of treatments, it was found that palak (v_3) grown under 50% agro shade net (green) (c_2) emerged as most remunerative for planting in North Gujarat conditions. Variation in these profit values was due to yield obtained from different treatment combinations which was accountable for maximum returns and benefit.

Conclusion

From present investigation it should be concluded that to obtain maximum yield with superior quality the palak should be grown under 50 per cent green agro shade net.

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