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## Influence of different growing conditions on yield and quality of leafy vegetables

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### Abstract

The higher values of yield attributes *viz.*, fresh weight of whole plant, fresh weight of shoot, fresh weight of root, yield per plot (2.60 Kg) and yield (7.14 t/ha) was recorded under polyhouse condition as compared to open field conditions. Among, the leafy vegetables amaranthus recorded higher values of yield attributes and yield. The vegetables produced under polyhouse condition have recorded the higher values of the quality parameters, *viz.*, vitamin A (7880 IU/100 g), vitamin C (84.15 mg/100 g), calcium content (324.15 mg/100 g), iron content (5.73 mg/100 g), total chlorophyll content (38.90 SPAD value), shelf life (4.67 and 11.25 days at ambient and refrigerator storage) and less PLW (45.85 and 14.76% at ambient and refrigerator storage) as compared to vegetables produced under open field conditions. Among, the leafy vegetables beet leaf recorded higher vitamin A (9343 IU/100g) and iron content (15.00 mg/100 g). The higher vitamin C (133.31 mg/100 g) and shelf life (5.01 and 10.49 days at ambient and refrigerator storage respectively) and less PLW (48.14 and 13.59% at ambient and refrigerator storage, respectively) was observed in coriander. The fenugreek produced under polyhouse recorded high calcium content (382.66 mg/100 g) and total chlorophyll content (48.48 SPAD value).

**Keywords:** Polyhouse, open field, leafy vegetables, yield, quality

### Introduction

The protected cultivation particularly in vegetable crops has made it possible for year round production and availability of quality produce both for domestic use and export purposes. Yield level of horticultural produce under these structures can be several times than those of open field conditions. The quality of produce is also produce superior and input use efficiencies are usually higher under such structures. More than 90% of Indian farmers have land holding with an average farm size of about 1.57 hectare comprising nearly 55% of the arable land. These farmers are resources-poor but are capable to sustain an intense and efficient agro- production system if provided with critical inputs like, technology, marketing and credit. The most important aspects are to insure greater participation of small and marginal farmers and convert their inherent weaknesses into opportunities. In order to realize the full benefit of the protected cultivation technology, appropriate package of practices for suitable varieties at various locations need to be promoted cc But the information regarding the performance of different leafy vegetables under protected conditions is very scanty. In recent days farmers are also asking the economics of leafy vegetables under protected conditions. Hence the present investigation was laid out.

### Material and Methods

An investigation entitled "Influence of different growing conditions on growth, yield and quality of leafy vegetables" was undertaken at the experimental farm, Department of Horticulture, VNMKV, Parbhani, during *Kharif* season, 2016. The experiment was laid out in Factorial Randomized Block Design (FRBD) with two growing conditions, open field ( $G_1$ ) and polyhouse ( $G_2$ ) with four leafy vegetables *viz.*, Amaranthus ( $V_1$ ), Beet leaf ( $V_2$ ), Coriander ( $V_3$ ) and Fenugreek ( $V_4$ ) comprising eight treatments replicated thrice. The leafy vegetables were shown on 20 August 2016 by line sowing methods with 15 cm row to row spacing. The observations on yield and quality tributes were recorded and subjected for statistical analysis as per Panse, V. G. and Sukhatme, P. V. (1985) [4].

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## Results and Discussion

### Yield parameters

The yield parameters as presented in Table 1 revealed that, the different yield parameters were significantly influenced due to growing conditions. The higher yield and yield attributes viz. fresh weight of whole plant, fresh weight of shoot, fresh weight of root, yield per plot (2.60 Kg) and yield 7.14 t/ha was recorded under polyhouse condition as compared to open field conditions. This might be due to environmental factors especially optimum temperature, relative humidity and light intensity provided to the plants grown under protected condition. The results are close conformity with the findings of Dhulakhandi *et al.*, (1995) [1] who reported that, higher yield of fenugreek 0.775 kg/m<sup>2</sup>, spinach 1.007 kg/m<sup>2</sup>; coriander 1.371 kg/m<sup>2</sup> and lettuce 0.888 kg/m<sup>2</sup> under green house.

Among the leafy vegetables amaranthus recorded higher yield attributes and yield. The amaranthus produced under polyhouse condition recorded maximum fresh weight of whole plant (50.36g), fresh weight of shoot (44.87g), fresh weight of root (5.49g), yield per plot (3.45 Kg) and yield 9.49 t/ha. The interaction effect on yield (t/ha) was found significant. Amaranthus grown under polyhouse recorded maximum (9.39 t/ha) yield which was statistically at par with beet leaf under polyhouse condition (9.20 t/ha), and it was minimum (1.80 t/ha) in fenugreek grown in open field condition. This might be due to genetic make up of the species and favourable environmental condition under polyhouse. Similar results reported by Sam and Regeena (2016) [6]. This might be also be due to more plant height, number of branches, number of leaves and leaf area in polyhouse which produced more carbohydrates through photosynthesis and ultimately increased yield. Similar results also reported by Kotadia *et al.*, (2012) [2].

### Quality parameters

Different quality parameters were also significantly influenced due to growing conditions (Table 2). The vegetables produced under polyhouse condition have recorded the higher values of the quality parameters, viz. vitamin A (8268.52 IU/100 g), vitamin C (84.15 mg/100 g), calcium content (324.15 mg/100 g), Iron content (17.95 mg/100 g), total chlorophyll content (38.90 SPAD value), shelf life (4.67 and 11.25 days at ambient and refrigerator storage) and less PLW (45.85 and 14.76% at ambient and refrigerator storage) as compared to vegetable produced under open field conditions. Among the leafy vegetables coriander recorded higher vitamin A (10460.49 IU/100g), vitamin C (133.31 mg/100g) and shelf life (5.01 and 10.49 days at ambient and refrigerator storage) and less PLW (48.14 and 13.59% at ambient and refrigerator storage). The higher Iron content (19.35mg/100g) was observed in amaranthus. The fenugreek recorded higher calcium content (375.49 mg/100g) and total chlorophyll content (47.13 SPAD value) than other leafy vegetables. The results of interaction effect with respect to the quality of vegetables showed that the high vitamin A (10821 IU/100g), vitamin C (134.78 mg/100g) and shelf life (6.03 and 12.00 days at ambient and refrigerator storage respectively) and less PLW (36.83 and 10.33% at ambient and refrigerator storage respectively) was recorded in coriander produced under polyhouse. The higher Iron content (20.70 mg/100g) was recorded in amaranthus produced under polyhouse. The fenugreek produced under polyhouse recorded high calcium content (382.66 mg/100g) and total chlorophyll content (48.48 SPAD value). Similar results obtained by Lekshmi and Celine (2015) [3] and Smitha (2002) [7] in tomato produced under protected conditions.

**Table 1:** Effect of growing conditions on biomass production of different leafy vegetables.

Treatment	Fresh weight of whole plant (g)	Fresh weight of shoot (g)	Fresh weight of root (g)	Root: shoot ratio (Fresh weight basis)	Yield per plot (Kg)	Yield (t/ha)
<b>Factor A: Growing conditions (G)</b>						
G <sub>1</sub> : Open field	15.82	14.30	1.52	0.10	1.09	3.04
G <sub>2</sub> : Polyhouse	30.33	26.87	3.46	0.12	2.60	7.14
SE <sub>±</sub>	0.85	0.76	0.09	0.004	0.06	0.17
CD at 5%	2.60	2.32	0.28	0.012	0.19	0.51
<b>Factor B: Leafy vegetables (V)</b>						
V <sub>1</sub> : Amaranthus	38.79	34.82	3.97	0.11	2.48	6.79
V <sub>2</sub> : Beet leaf	36.05	32.28	3.77	0.11	2.36	6.57
V <sub>3</sub> : Coriander	8.52	7.37	1.15	0.15	1.18	3.31
V <sub>4</sub> : Fenugreek	8.95	7.87	1.08	0.13	1.35	3.78
SE <sub>±</sub>	1.21	1.08	0.13	0.006	0.08	0.24
CD at 5%	3.68	3.28	0.40	0.017	0.27	0.72
<b>Growing conditions (G) x Leafy vegetables (V)</b>						
G <sub>1</sub> V <sub>1</sub> : Amaranthus in open field	27.21	24.76	2.45	0.09	1.51	4.18
G <sub>1</sub> V <sub>2</sub> : Beet leaf in open field	24.89	22.58	2.31	0.10	1.42	3.94
G <sub>1</sub> V <sub>3</sub> : Coriander in open field	6.56	5.72	0.84	0.14	0.79	2.22
G <sub>1</sub> V <sub>4</sub> : Fenugreek in open field	4.60	4.14	0.46	0.11	0.63	1.80
G <sub>2</sub> V <sub>1</sub> : Amaranthus in polyhouse	50.36	44.87	5.49	0.12	3.45	9.39
G <sub>2</sub> V <sub>2</sub> : Beet leaf in polyhouse	47.21	41.98	5.23	0.12	3.31	9.20
G <sub>2</sub> V <sub>3</sub> : Coriander in polyhouse	10.48	9.03	1.45	0.16	1.57	4.40
G <sub>2</sub> V <sub>4</sub> : Fenugreek in polyhouse	13.29	11.60	1.69	0.14	2.07	5.57
SE <sub>±</sub>	1.71	1.53	0.18	0.008	0.12	0.33
CD at 5%	5.20	4.64	0.56	0.024	0.38	1.02

**Table 2:** Effect of growing conditions on nutritive value of different leafy vegetables.

Treatment	Vitamin 'A' content (IU/100 g)	Vitamin 'C' content (mg/100 g)	Calcium (Ca) content (mg/100 g)	Iron (Fe) content (mg/100g)	Total chlorophyll content (SPAD Value)
<b>Factor A: Growing conditions (G)</b>					
G <sub>1</sub> : Open field	7697.45	81.89	309.25	16.09	34.47
G <sub>2</sub> : Polyhouse	8268.52	84.15	324.15	17.95	38.90
SE <sub>±</sub>	291.24	3.15	9.78	0.54	1.16
CD at 5%	883.34	NS	29.67	1.65	3.53
<b>Factor B: Leafy vegetables (V)</b>					
V <sub>1</sub> : Amaranthus	8744.00	77.91	373.81	19.35	35.09
V <sub>2</sub> : Beet leaf	9342.51	69.26	353.50	15.49	34.22
V <sub>3</sub> : Coriander	10460.4	133.31	163.99	17.09	30.32
V <sub>4</sub> : Fenugreek	3384.93	49.61	375.49	16.16	47.13
SE <sub>±</sub>	411.88	4.45	13.83	0.77	1.64
CD at 5%	1249.24	13.52	41.96	2.34	4.99
<b>Growing conditions (G) x Leafy vegetables (V)</b>					
G <sub>1</sub> V <sub>1</sub> : Amaranthus in open field	8499.00	78.97	365.99	18.00	32.96
G <sub>1</sub> V <sub>2</sub> : Beet leaf in open field	9070.00	68.58	345.67	14.85	32.03
G <sub>1</sub> V <sub>3</sub> : Coriander in open field	10099.9	131.84	157.00	16.20	27.13
G <sub>1</sub> V <sub>4</sub> : Fenugreek in open field	3120.80	48.19	368.32	15.32	45.77
G <sub>2</sub> V <sub>1</sub> : Amaranthus in polyhouse	8989.00	80.85	381.63	20.70	37.23
G <sub>2</sub> V <sub>2</sub> : Beet leaf in polyhouse	9615.00	69.94	361.32	16.13	36.40
G <sub>2</sub> V <sub>3</sub> : Coriander in polyhouse	10821.0	134.78	170.99	17.98	33.50
G <sub>2</sub> V <sub>4</sub> : Fenugreek in polyhouse	3649.07	51.03	382.66	16.99	48.48
SE <sub>±</sub>	582.48	6.30	19.56	1.09	2.32
CD at 5%	1766.69	19.12	59.34	3.31	7.06

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