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## Influence of different growing conditions on meteorological parameters and germination of leafy vegetables

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### Abstract

The results of the present investigation indicated that, the mean highest temperature (33.27 °C) and relative humidity (91.28 %) was recorded under polyhouse growing condition, while, it was lower in open field condition. The highest mean light intensity (43,781 Lux) was observed under open field growing condition during the experimental period. The high germination percentage and minimum days to potential germination (7.75) were recorded under polyhouse condition as compared to open field conditions. Among, the leafy vegetables, amaranthus recorded higher germination percentage, and showed better performance with respect to most of the growth attributes of the plant. It has also taken less number of days (4.73) for potential germination.

**Keywords:** polyhouse, open field, amaranthus, germination

### Introduction

Leafy vegetable production, at present, is also characterized by a strong dependence on chemical plant protection with its all inherent environmental and health hazards, both for the growers and consumers. Striking a balance between all season availability of high quality leafy vegetables with minimum environmental impact, and still to remain economically competitive in this time of globalization, is major challenges for the modern technology of vegetable production so protected cultivation offers several advantages to produce high yield and superior quality of leafy vegetables, thus efficiently using the land and other resources. This becomes relevant to leafy vegetable growers in India who have small holding say less than one hectare. They would be interested in a technology, which helps them to produce more crops each year from their land, particularly during off-season when prices are higher. 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<sup>[6]</sup>. The experiment was laid out in Factorial Randomized Block Design (FRBD) with two growing conditions, open field (G<sub>1</sub>) and polyhouse (G<sub>2</sub>) with four leafy vegetables *viz.*, Amaranthus (V<sub>1</sub>), Beet leaf (V<sub>2</sub>), Coriander (V<sub>3</sub>) and Fenugreek (V<sub>4</sub>) 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 metrological parameters as well as growth *viz.*, germination %, days required for potential germination were recorded and subjected for statistical analysis as per Panse, V. G. and Sukhatme, P. V. (1985)<sup>[8]</sup>.

### Results and Discussion

#### Effect of meteorological parameters

The data presented in Table 1 regarding different meteorological parameters influenced due to growing conditions clearly indicated that, the temperature was high under polyhouse. condition, while, it was low under open field growing conditions. The light absorption and less ventilation in polyhouse might have increased inside temperature of the polyhouse.

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The higher temperature during daytime was due to tapping of short wave radiation in the polyhouse. Nimje and Shyam (1993) [7] also obtained similar results. The relative humidity was high under polyhouse condition, while, it was low under open field growing conditions. The possible reason for this might be that the polyhouse was filled with the vegetation and plants were well watered, the ground surface of the polyhouse was always wet. During night, certain quantum of water from soil gets evaporated. Since polyhouse was covered with ultra violet stabilized sheet and also due to absence of solar radiation, the escape of water vapour from the polyhouse to outside was comparatively less during night. Besides, at early morning, when sun starts shining, there will be more transpiration from the leave. Both these factors together caused higher relative humidity inside the polyhouse. Since, in this study, polyhouse was naturally ventilated, this effect does not prolong for longer period, but it occurred hardly for an hour after sunrise. Similar, results reported by Umesha *et al.*, (2011) [9] under naturally ventilated polyhouse house and open field. Light is a prerequisite of plant growth. Plant matter is produced by the process of photosynthesis, which takes place only when light is absorbed by the chlorophyll (green pigment) in the green parts of the plant, mostly in the leaves. The results revealed that, the light intensity inside the polyhouse was found to be much lower than in open field. Further, it was also observed that, during morning and evening hours, there was low light intensity. These results are in accordance with those of Albright (1990) [1] who observed that, the light intensity was less in polyhouse. A fully grown leafy vegetables benefits from any increase in natural light intensity, provided the plants are well supplied with water, nutrient, carbon dioxide, and the air temperature is presented from becoming too high. Similar, results reported by Umesha *et al.*, (2011) [9] under naturally ventilated polyhouse and open field. The light intensity was maximum in open field as compared to polyhouse. It might be due to the sun rays are maximum in open field as compared to polyhouse condition. Similar, results also reported by Kotadia *et al.*, (2012) [6] under shade net house and open field.

#### Effect on Germination (%)

The data on germination and growth attributes of different leafy vegetables as influenced by different growing conditions. The seed germination of different leafy vegetables sown under different growing conditions was not significantly

influenced. It indicates that, the differences in various characters were due to the treatment effects. The results showed that the maximum (90.07 %) germination percentage was observed under polyhouse condition and it was minimum (86.14 %) in open field condition. It was due to optimum temperature and humid atmosphere in natural ventilated poly house, this finding is supported by Jeeva and Sathiyamurthy (2001) [4]. Among the leafy vegetables tried the maximum germination percentage was recorded in amaranthus (91.99 %), followed by fenugreek (90.02 %), while it was minimum (82.93 %) in coriander.

Similar, results were obtained by Isaac (2015) [3], who reported that, germination was rapid in amaranthus varieties, while, it was slowest in coriander under polyhouse. It is understood that coriander seeds require seed treatment procedure to stimulate germination, while, these were not compulsory in the other crops included in the study. In the open field, crop establishment was very poor and could not be raised successfully due the heavy rains. The results are in close conformity with the findings of Dixit (2007) [2], who reported that, the germination percentage in different leafy vegetables was found 10-20% more under greenhouse condition as compared to open field. Similar results have also been obtained by Karetha *et al.*, (2014) [5] in coriander.

#### Effect on Days to potential germination

The days to potential germination of different leafy vegetables sown under different growing conditions was significantly influenced. The minimum (7.75) days required for potential germination were observed under polyhouse condition, while maximum (9.40) days were required in open field condition. Among leafy vegetables minimum days (4.73) to potential germination was required for amaranthus, followed by fenugreek (5.29), while, it was maximum (18.70) in coriander. The interaction effect of growing conditions and leafy vegetables on days to potential germination was found significant. The treatment combination of polyhouse + amaranthus required minimum (4.13) days to potential germination, followed by fenugreek grown under polyhouse (4.70), while, it was maximum (20.37 days) in coriander in open field condition. This might be due to the fact that light is the most important factor influencing the growth of leafy vegetables. Very high light intensity in open field has been reported to be injurious to the leafy vegetables. Similar, trend of results was also noticed by Kotadia *et al.*, (2012) [6].

**Table 1:** Effect of growing conditions on weather parameters during experimental period.

MW	Period	Average temperature (°C)				Average relative humidity (%)				Average light intensity (Lux)			
		G <sub>1</sub> Open field		G <sub>2</sub> Polyhouse		G <sub>1</sub> Open field		G <sub>2</sub> Polyhouse		G <sub>1</sub> Open field		G <sub>2</sub> Polyhouse	
		am	pm	am	pm	Am	pm	am	pm	am	pm	am	pm
34	20-26 Aug.	21.4	32.4	24.1	35.61	87	53	89	64	20528	76114	7557	20285
35	27Aug.- 02 Sept.	22.5	31	24	34.04	92	68	91	82	20457	49614	5385	12014
36	03-09 Sept.	20.7	30.9	23.78	33.29	81	58	83	70	19128	50851	5471	15142
37	10-16 Sept.	22.4	29.3	23.35	32.4	88	78	94	90	13157	19428	4314	6028
38	17-23 Sept.	22.3	29.6	22.69	32	96	85	95	91	8685	16885	3028	6500
39	24-30 Sept.	21.6	30.2	22.57	32.95	91	73	93	90	12300	48100	3642	10842
40	01-07 Oct.	21.3	29.4	22.4	31.89	93	72	94	88	10869	45457	3409	8726
	Mean	21.76	30.4	23.26	33.27	89.70	69.56	91.28	82.13	15017	43781	4686	11404

**Table 2:** Effect of growing conditions on germination and of leafy vegetables.

Treatment	Germination (%)	Days to potential germination
<b>Factor A: Growing conditions (G)</b>		
G <sub>1</sub> : Open field	86.14	9.40
G <sub>2</sub> : Polyhouse	90.07	7.75
SE <sub>±</sub>	2.86	0.39

CD at 5%	NS	1.20
<b>Factor B: Leafy vegetables (V)</b>		
V <sub>1</sub> : Amaranthus	91.99	4.73
V <sub>2</sub> : Beet leaf	87.47	5.57
V <sub>3</sub> : Coriander	82.93	18.70
V <sub>4</sub> : Fenugreek	90.02	5.29
SE <sub>±</sub>	4.04	0.56
CD at 5%	NS	1.71
<b>Growing conditions (G) x Leafy vegetables (V)</b>		
G <sub>1</sub> V <sub>1</sub> : Amaranthus in open field	89.97	5.33
G <sub>1</sub> V <sub>2</sub> : Beet leaf in open field	85.86	5.99
G <sub>1</sub> V <sub>3</sub> : Coriander in open field	80.66	20.37
G <sub>1</sub> V <sub>4</sub> : Fenugreek in open field	88.04	5.88
G <sub>2</sub> V <sub>1</sub> : Amaranthus in polyhouse	94.01	4.13
G <sub>2</sub> V <sub>2</sub> : Beet leaf in polyhouse	89.07	5.15
G <sub>2</sub> V <sub>3</sub> : Coriander in polyhouse	85.20	17.03
G <sub>2</sub> V <sub>4</sub> : Fenugreek in polyhouse	92.00	4.70
SE <sub>±</sub>	5.72	0.79
CD at 5%	NS	2.41

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