

## **Effect of greenhouse and shade net on isabgol crop**

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### **ABSTRACT**

A study was conducted to evaluate the combined effects of greenhouse and shade net on Isabgol crop environment in a semi-controlled modified Quonset type greenhouse (100 m<sup>2</sup>) at Nagarjuna Medicinal Plant Unit, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra State), India. Shade net (50 %) was covered from inside the greenhouse at gutter height. Results revealed that light intensity was reduced by 10380.85 lux while ambient temperature and soil temperature were lowered by 1.3 °C and 5.1 °C, respectively. Relative humidity increased by 5 per cent inside greenhouse. The seed yield of Isabgol inside greenhouse increased by 78 per cent as compared to the crop grown outside.

*Key words:* Green house, shade net, Isabgol

Greenhouse crop production is based on management of crop environment in such a way that the conditions become favorable for maximum yield. Under adverse environmental conditions, in the greenhouse, the relative humidity, CO<sub>2</sub> concentration, ambient and soil temperatures are ameliorated so as to help to mitigate stress. An attempt was made to evaluate the effect of greenhouse and the shade net on various parameters enveloping crop environment.

### **MATERIALS AND METHODS**

A 100 m<sup>2</sup> semi controlled modified Quonset type greenhouse having 16 X 6 m<sup>2</sup> cultivable area and 2 X 2 m<sup>2</sup> cabin for hanging electrical panels and instruments was constructed on turnkey basis under an ICAR ad hoc scheme "Greenhouse Management For Propagation of Some

Horticulture and Medicinal Plants" at Nagarjuna Medicinal Plant Unit, Dr. P. D. K. V., Akola (MS), India. A 50 per cent shade net was provided at gutter height inside the greenhouse to reduce light intensity. The side ventilators of the greenhouse were kept closed during night hours. As and when the temperature shot up to 40 °C and beyond, the ventilators were closed even in the day and a fan-pad system was operated. The environmental parameters viz., ambient air temperature, soil temperature, light intensity and relative humidity were recorded both, inside and outside the greenhouse, at three positions i.e. 1m from fan end, centre of greenhouse and 1m from the pad end. The three readings of each parameter were averaged and were considered for that particular time. These parameters were recorded from 8.00 am to 8.00 pm, at 2 hr interval during the

growth period (Dec, 03 to March, 04) of Isabgol crop. The overall average of the reading, at a time, throughout the crop season, was calculated to evaluate the effect of greenhouse and shade net on the crop environment in respect of various parameters. Seed as well as biomass yield were also recorded.

## RESULTS AND DISCUSSION

### *Light intensity*

Light intensity reached at its peak value at 12 hrs IST both, inside (4712 lux) and outside (22389 lux) the greenhouse (Table 1). But the temperature inside greenhouse reached its peak value of 38.0°C at 16.00 hrs IST and that outside (40.9°C) at 14.00 hrs. The temperatures both, inside and outside greenhouse were found approximately equal from 18.00 hrs onwards. It could be observed that light intensity and temperature inside the greenhouse were lower by 10380.85 lux and 1.3 °C, respectively as compared to those that existed outside the greenhouse. Even though, the difference in light intensity that prevailed inside and outside greenhouse, was very high, the temperature profiles were not altered much. Results have very clearly brought out that the crop grown inside the greenhouse could be well protected from the cold blows or adverse environmental conditions.

### *Soil temperature*

Though, the light intensity was maximum at 12.00 hrs IST both, inside and outside the greenhouse, the soil temperature reached the maximum at 16.00 hrs IST It

was 34.3°C inside the greenhouse and 42.2°C outside the greenhouse, showing the effect of shade net inside the greenhouse, a difference of about 8.0°C. The difference was found to be lower in the morning and evening hours (Table 1)

### *Ambient and soil temperature*

The increase in ambient temperature both, inside and outside the greenhouse was very high between 8.00 to 10.00 hrs IST by 12.7 and 13.1°C, respectively. It was observed that from 10.00 hrs onwards, up to 14.00 hrs, the temperature increased only by about 2°C in each next 2 hrs time period slot. From 16.00 hrs onwards there was abrupt downfall in temperature change. It was 10 °C during 16.00 to 18.00 hrs and 7 °C from 18.00 to 20.00 hrs both inside and outside the greenhouse. Soil temperature profile was observed to be smooth. An increment of about 2 to 3 °C was observed in soil temperature from 8.00 to 14.00 hrs in both the cases. Whereas, from 14.00 hrs onwards it lowered by 2 to 3°C during each next 2 hr period. After 12.00 hrs, the soil temperature in the crop grown outside greenhouse was observed to be higher as compared to the ambient temperature inside the greenhouse. On an average, there was a difference of about 5.1°C in soil temperature between, inside and outside the greenhouse. The outside ambient and soil temperatures remained always higher than those that prevailed inside. During the day, soil temperature inside the greenhouse increased by 9.0°C only compared to an increase of about 17°C outside the greenhouse. During evening hours, the soil

**Table 1:** Environmental parameters inside and outside greenhouse during the day

Time of day (hrs)	Light Intensity (lux)		Temperature ( $^{\circ}$ C)		Relative humidity (%)		Soil Temperature ( $^{\circ}$ C)	
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
8.00	1435	6596	19.5	21.0	69	60	25.1	27.0
10.00	3254	16477	32.2	34.1	35	28	28.6	34.0
12.00	4712	22389	36.1	38.5	28	23	32.1	39.0
14.00	3794	20538	37.8	40.9	25	20	34.0	42.0
16.00	2464	11217	38.0	38.7	27	22	34.3	40.6
18.00	195	923	27.2	27.1	41	38	31.9	36.2
20.00	--	--	20.8	20.5	57	55	29.0	32.3

**Table 2:** Biometric observations of isabgol grown inside and outside the greenhouse

Plot No.	Inside the greenhouse					Outside the greenhouse		
	No. of panicles	Panicle length, cm	Plot No.	No. of Panicles	Panicle length, cm	Plot No.	No. of panicles	Panicle length, cm
L1	10	3.4	R1	12	3.6	1	11	2.6
L2	15	4.2	R2	14	4.5	2	16	2.8
L3	14	3.8	R3	12	3.9	3	15	2.7
L4	15	3.9	R4	15	4.1	4	16	2.8
L5	19	4.0	R5	13	3.6	5	14	2.5
L6	19	4.0	R6	14	3.7	6	15	2.3
L7	12	3.6	R7	9	3.6	--	--	--

temperature was observed to be higher than the ambient air temperature (Table 1). Relative humidity inside the greenhouse was always observed to be higher by 5 per cent than that existing outside.

#### *Biometric observations*

The biometric characters viz., plant height, panicle length and number of panicles per plant were measured both,

inside and outside the greenhouse. Average plant height inside the greenhouse was 23.6 cm and at outside it was 15.5 cm. The panicle length of crop grown inside the greenhouse was observed to be 38.7 cm and in the crop grown outside it was 26.2 cm (Table 2), which may be attributed to the favorable conditions inside the greenhouse. Bharambe and Ghodke (June, 2000) also reported about 1.5 times higher vegetative

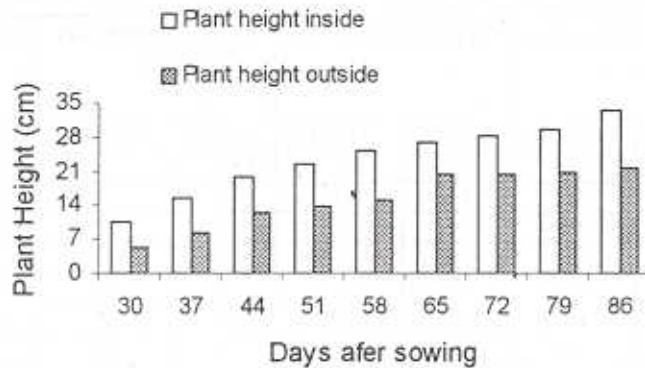


Fig. 1: Plant height with respect to growth period inside and outside greenhouse

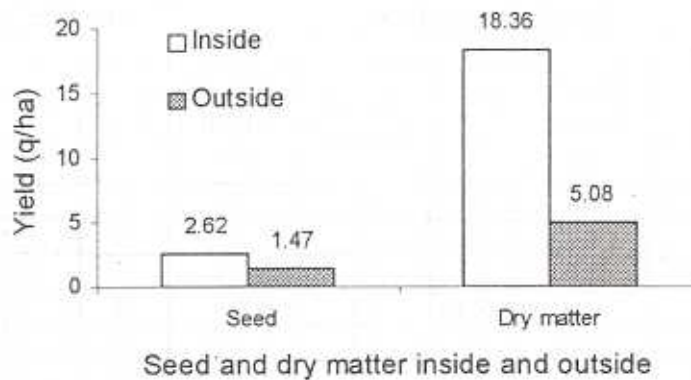


Fig. 2: Seed and biomass yield inside and outside greenhouse.

growth of crop grown in greenhouse as compared to control.

#### Yield

The seed and biomass yield was 2.62 and 18.36 q ha<sup>-1</sup>, respectively, inside the greenhouse. The corresponding values were 1.47 and 5.08 q ha<sup>-1</sup> for the crop grown outside the greenhouse, respectively. This shows that there was 1.78 and 3.6 times increase in seed and biomass yield,

respectively in case of the crop grown inside greenhouse, compared to that grown outside.

#### CONCLUSION

Using 50 per cent shade net, inside the greenhouse, at gutter height, the light intensity, air and soil temperatures could be reduced while the relative humidity could be increased.

**REFERENCE**

- Raut, N.L., Golait S.D., Deshmukh A.P. 2004. Energy requirement for construction of greenhouse and performance of Isabgol crop. Unpublished B. Tech. Thesis submitted to Dr. P.D.K.V. Akola
- Bharambe, V.B. and Ghodke, N.M. 2000. Study of biometric characteristics and yield of medicinal crop Isabgol in poly greenhouse and control plot. Unpublished B.Tech. Thesis submitted to Dr. P. D. K. V., Akola