

Modified Single Span Greenhouse for Small Farmers in the West Coastal Ecosystem



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Coastal Ecosystem is the most important of the factors in agricultural or food production, featuring at the base of poverty alleviation programmes (Sen *et al*, 2011). It is estimated that nearly 40 % of cities larger than 500,000 populations are located in the coast in India, and yet threatened by a series of factors threatening the livelihood and very sustenance of the ecosystem (Poyya and Balachandran, 2008).



Integrated farming systems are projected as the sustainable production systems for the coasts (Sen *et al*, 2011). Greenhouse technology with the potential to enhance crop production per unit area of land could be introduced as a component of the

integrated farming systems and serve as a good option for enhancing income of small and marginal coastal farmers.

The west coast is characterized by moderate to high temperature, high humidity and high rainfall. Small greenhouses (area : 100 -200 sq.m.) could serve as rain shelters and also provide favorable environmental conditions for crop production could offer livelihood options for the horticulture based integrated farming systems. Research at ICAR-CCARI was focused on testing modified structures suitable for the west coastal ecosystem. A modified single-span greenhouse with screened vents along its east and west and southern sides was used for research on cucumber production during 2014-2017. The objective of the research was to (i) analyze the suitability of the structure for Cucumber production vis-a-vis its microclimate and (ii) determine the suitable varieties for cucumber production.

Structure

The single-span modified greenhouse was oriented 12 degrees NE-SW, with a plan area of 20mX10m, gutter height 3.5 m and ridge height 4.5 m. The structure had 1m plastic skirt and shade net fixed on vents along the east, west and north side, with gutters along east and west side, with roll-able PE (polyethylene) covers over them. On the ridge, along the length of the roof another 0.5m wide vent was provided. On the northern end it was fully covered by plastic with a (3m X 2m X 3m) isolation chamber. After the first year of studies, two horizontal axial flow fans were fixed inside the greenhouse to improve homogeneity of microclimate.



Modified single-span greenhouse

Microclimate

The structures served as a rain shelter during rainy season. During *Kharif* temperature in the structure went up to a maximum of 40.5 and a minimum of 23.3°C while the relative humidity ranged from a maximum of 98.7 to 53.7%. In the *Rabi* the temperature ranged from a maximum of 42.5 to 13.1°C while relative humidity ranged from 94.7 to 26.1 %. The microclimate could further be improved if the structures are mechanically ventilated. Replacing the shade nets on all vents with insect-proof nets could provide better protection from pests and diseases. Temperature and humidity data inside the structure during the year are as under:

Season	TEMP (MAX), deg C	TEMP (MIN), deg C	RH (MAX), %	RH (MIN), %	DPT (MAX), deg C	DPT (MIN), deg C
<i>Kharif</i>	40.5	23.2	98.2	53.7	31.2	22.6
<i>Rabi</i>	42.5	13.1	94.7	26.1	29.1	10.9

Cucumber Varieties Suitable for Cultivation under Single-Span Greenhouse in West Coastal Ecosystem- an evaluation

Six varieties of cucumber *viz.*, Pyramid's Gypsy (F1 Hybrid) , Seminis -RS-03602833 (F1 Hybrid), Nunhems-Kian(F1 Hybrid) and Hilton (F1 Variety), Semillas Fito India Ltd-

Greenhouse in the West Coastal Ecosystem

Angel (F1 Hybrid), Holland Seeds' -Infinity(F1 Hybrid)have been evaluated under the single span greenhouses. Among the evaluated varieties, Kian (2.38 ± 0.28 kg/plant)performed very well during *Rabi* season and Gypsy (2.64 ± 0.39) performed well during the Kharif.



GYPSY



KIAN

Data recorded on these hybrids are given below.

S.No	Variety period	Crop 50%	Days to first flowering	Days to First harvest	Average Yield \pm S.D. plant.(kg)	Average fruit weight, gm	Average Fruit Dia., cm	Average Fruit length, cm
1.	Gypsy	<i>kharif</i>	2/8/2014 (female flowers)	11/8/2014	2.64 ± 0.39	260.09 ± 0.07	4.11 ± 0.42	16.18 ± 2.05
2.	Kian	<i>Rabi</i>	4/11/2014	7/11/2014	2.38 ± 0.28	163.81 ± 42.39	3.22 ± 0.24	15.03 ± 1.35

Cucumber Pests in Greenhouse

The common insect pests that infested the cucumber crop during cultivation in the greenhouse were cucumber caterpillar, mites, Aphids, white flies, leaf miner. In order to minimise the entry of insect pests in greenhouse the shadenet screens should be replaced with insect proof nets. The insect pests were managed by recommended dosage of standard insecticides.



Cucumber Caterpillar



Leaf Miner



Red Spider Mite



Aphids

Cucumber diseases in Greenhouse

Damping off is common in the initial stages of crop growth where the soil moisture is high. Foliar diseases like downy mildew and leaf blights are the important disease problems in greenhouse cucumber as higher temperature and humidity favours the disease development. Root knot nematode problem is severe in cucumber grown in greenhouse. Recommended management practices should be followed under professional guidance.



DOWNY MILDEW INFECTION



LEAF BLIGHT INFECTION

Conclusion:

Cucumber cultivation under single span greenhouse could be a good livelihood enhancement option for small and marginal farmers in the west coast. For better microclimate and less pest and disease incidence, mechanically ventilated greenhouses with insect proof nets fixed on all vents should be adopted.

References:

1. PoyyaMoli G and Balachandran N (2008) Strategies for conserving ecosystem services to restore coastal habitats. Paper presented in UNDP-PTEI Conference on "Restoration of Coastal Habitats", held at Mahabalipuram, Tamil Nadu, 20-21 August, 2008.
2. Sen, H.S., N.Sahoo, D.P.Sinhababu, Sanjoy Saha and K.S.Behera (2011) Improving agricultural productivity through diversified farming and enhancing livelihood security in coastal ecosystem with special reference to India. *Oryza*, 48 (1):1-21



ROOT KNOT NEMATODE INFECTION