**Growth and yield of cassava (*Manihot esculenta* Crantz) as influenced by light stress**

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## Kerala

- Geographical area 38.85 lakh ha
  cultivable area 22.93 lakh ha
  Coconut occupies 40% of this
  Homestead farming

**Open space available for cultivation is limited**

## SHADE RESPONSE STUDIES

- Tuber crops- Cassava, Sweet potato, greater yam, Lesser yam, Taro, Tannia, Elephant foot yam, Coleus and Arrow root
- Vegetable crops
- Cereals
- Spices

## Classification of crops

- **Shade sensitive crops-** Drastic reduction in yield even with low levels of shade
- **Shade intolerant crops-** Decrease in yield will be almost proportional to the increase in shade level
- **Shade tolerant crops-** Marginal decrease in yield due to shading
- **Shade loving crops-** Increase in yield under shade compared to open

## Shade studies

Shade sensitive - Cassava, sweet potato, Coleus

Shade intolerant - Greater yam ,Lesser yam

Shade tolerant - Elephant foot yam, Colocasia

Shade loving - Arrowroot, Xanthosoma

## Cassava (*Manihot esculenta*)

- Sun loving plant
- Intercropped mainly under mature coconut palms
- Along with banana
- Home gardens

## Cassava in coconut garden

## Cassava in different situations

## HOMESTEAD SITUATION

- Serious constraint while intercropping -insufficiency of light

## Intercrop in coconut garden

- The active root zone of coconut is confined only to 25 per cent of the available land area.
- So the interspaces in coconut garden can be effectively utilized for growing crops which are suited for that area.
- Light infiltration pattern & intensity varies in coconut garden

## Constraint

- The major physiological constraint to productivity under such situation is the capacity of the crop to adapt to shade.
- Depending upon the age of the coconut palm the shade intensities vary from 30 to 80 per cent of open.
- **Choice of crops therefore should be based on shade response of crops.**

## Infiltration of sunlight

- With increase in age of palm light infiltration also increases
- Age-20 20% light transmission
- Age 40 50% light transmission
- Age70 80% light transmission

## Coconut palms

## Objective

To study the response of cassava under different light intensities and to evaluate their performance on the basis of yield.

## Materials And Methods

Site : Instructional Farm,
College of Agriculture, Vellayani,
Thiruvananthapuram.

Soil Type – Sandy Clay Loam

Open land area receiving full sunlight without shade was selected for the experiment

## Materials And Methods

**Initial Soil test values**

- Soil reaction – Acidic pH 5.0
- Available N – Low (163 kg $ha^{-1}$)
- Available $P_2O_5$ – High (51.53 kg $ha^{-1}$)
- Available $K_2O$ – Medium (224 kg $ha^{-1}$)
- Organic Carbon – Low (0.48 per cent)

## Materials And Methods

Design : Randomized block design (RBD)

Treatments: 4

S1 – 0pen (0 per cent shade)

S2 – 25 per cent shade

S3 – 50 per cent shade

S4 – 75 per cent shade

Replication – 5

**Crop – Cassava** **Variety – M4**

## Materials And Methods

**Artificial shading**

- Green coloured high density poly ethylene net
- Pandal size : 20 x 6 m
- Spacing between pandals : 3m
- Light intensity measurement : Line quantum sensor

**Artificial Shade**

## Results and Discussion

**Effect of shade on Plant height of cassava**

| Treatments | Plant Height (cm) | |
|---|---|---|
| | I Year | II year |
| $S_0$ | 360.00 | 306.00 |
| $S_{25}$ | 420.80 | 412.20 |
| $S_{50}$ | 434.00 | 435.60 |
| $S_{75}$ | 448.20 | 449.20 |
| SEm ± | 2.820 | 2.828 |
| CD(0.05) | 8.012 | 8.038 |

## Results and Discussion

**Effect of shade on Dry matter production of cassava**

| Treatments | Dry matter production (t $ha^{-1}$) | |
|---|---|---|
| | I year | II Year |
| $S_0$ | 18.55 | 17.87 |
| $S_{25}$ | 11.93 | 10.57 |
| $S_{50}$ | 8.51 | 7.75 |
| $S_{75}$ | 7.03 | 6.37 |
| SEm ± | 0.088 | 0.075 |
| CD(0.05) | 0.251 | 0.212 |

**Low light intensities cause stress on plant as irradiance limits photosynthesis thus net carbon gain and dry matter accumulation**

## Results and Discussion

**Effect of shade on Specific leaf weight of cassava**

| Treatments | Specific leaf weight (mg $cm^{-1}$) | |
|---|---|---|
| | I Year | II Year |
| $S_0$ | 7.20 | 6.68 |
| $S_{25}$ | 6.30 | 6.03 |
| $S_{50}$ | 6.20 | 5.85 |
| $S_{75}$ | 4.90 | 4.52 |
| SEm ± | 0.014 | 0.074 |
| CD(0.05) | 0.038 | 0.211 |

## Results and Discussion

**Effect of shade on Chlorophyll content of cassava**

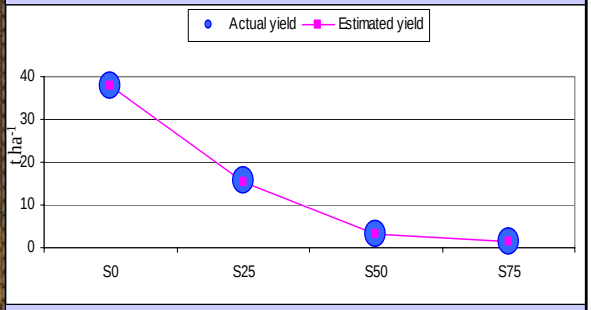
| Treatments | Chlorophyll content (mg $g^{-1}$) | |
|---|---|---|
| | I year | II year |
| $S_0$ | 3.12 | 3.12 |
| $S_{25}$ | 3.93 | 3.87 |
| $S_{50}$ | 5.01 | 4.96 |
| $S_{75}$ | 4.53 | 4.26 |
| SEm ± | 0.027 | 0.032 |
| CD(0.05) | 0.077 | 0.091 |

## Results and Discussion

**Effect of shade on yield of cassava**

| Treatments | Tuber Yield (t ha$^{-1}$) | |
|---|---|---|
| | I Year | II Year |
| $S_0$ | 37.87 | 37.69 |
| $S_{25}$ | 15.64 | 15.50 |
| $S_{50}$ | 3.20 | 3.24 |
| $S_{75}$ | 1.35 | 1.35 |
| SEm ± | 0.270 | 0.230 |
| CD(0.05) | 0.765 | 0.653 |

**Yield response of cassava under different intensities of shade**




**Y = 37.91 - 1.099x + 0.008152x²**

**$\overline{R^2}$ = 0.9999**

## The experiment suggested that

- Cassava var. Malayan – 4 is highly sensitive to shade.
- Shade induced deleterious effects on the growth and dry matter production of cassava
- Produced elongated stem and thinner leaves, which resulted in reduced yield.
- Number of tubers and tuber yield reduced.

## Conclusion

- The result of the present study revealed that the decline in cassava yield due to shade was drastic.
- The highest yield was obtained from plots without shade.
- The yield at 25, 50, and 75% shades were only 49, 8.5 and 3.6% respectively of the open.
- Hence the crop can be classified as shade sensitive crop

## Recommendation

- Cassava being an important food crop of the farming community of Kerala (India) can be recommended for cultivation under low light situation (25 per cent shade)
- Coconut plantation of age above 25 years is only suited for inter cropping cassava
- Yield reduction of 50 per cent as that of open condition.
- Additional income from unit land area.

## Future line of work

- Screening cassava varieties under different intensities of shade
- Similar studies on other tuber crops
- Developing shade tolerant varieties
- Biochemical variation under shade

## Vellayani Hraswa

THANK YOU