REFERENCES

DESHMUKH, P. B. and PATEL, M.J. (1992). Effect of different concentrations of bagalol (MEMC) on sugarcane. **Indian J. Mycol. Pl. Pathol., 22 :** 107-108.

GANGULLY, A. (1964). Wilt. In : **Sugarcane Disease of the World** Vol. II. Elsevier publishing Company, Amsterdam. 131 pp.

KALAIMANI, T., NATRAJAN, S., PADMANABAN, S. and RAJESEKARAN, S. (1989). Wilt disease of sugarcane and its management. **Bharatiya Sugar 15 :** 45-46.

Parthasarathy S. V. (1972). **Sugarcane in India**. The K. C. P. Ltd., Madras, 685 pp

PATEL, J.A. (1989). Studies on wilt (*F. moniliforme*) of sugarcane under South Gujarat conditions. M.Sc. (Agri.) thesis Gujarat Agricultural University, Sardar Krushinagar.

SARMA, M.V. (1976). Wilt diseases of sugarcane Sugarcane **Pathol. Newsl., 15 :** 30-33.

SINGH, K., ALEXANDER, K.C. and BUDHRAJA, T.R. (1971). Ferric dimethyl dithiocarbamate as a sugarcane sett protection. **Ind. Phytopath.., 24 :** 640-643.

SINGH, N., SINGH, R.P. and LAL, S. (1985). Effect of soil amendment and sugarcane wilt and its pathogens. Acta **Botanica Indica 13 :** 212-217.

WARAITCH, K.S., KUMAR, B. and KANWAR, R.S. (1985). Treatment of sugarcane setts with systemic and non systemic fungi toxicants in relation to germination and cane yield. **Ind. Sugar 35 :** 355-357.

(Received : June 1995 Revised : January 1996)

|Madras Agric. J., 84(2): 59-63 February 1997
https://doi.org/10.29321/MAJ.10.A00838

EFFECT OF IRRIGATION REGIMES, COMRADE CROPPING AND SOIL AMENDMENTS ON LAND EQUIVALENT RATIO AND YIELD OF CASSAVA, GROUNDNUT AND SESAME

M. AYYASWAMY, C. CHINNUSAMY AND A. BALASUBRAMANIAN

Agricultural Research Station
Tamil Nadu Agricultural University
Bhavanisagar 638 451

ABSTRACT

The study revealed that irrigation at 0.6 IW/CPE ratio recorded maximum yields. Cassava raised as sole crop or as comrade cropping in groundnut recorded comparable tuber yield. Either sole groundnut or sesame or in combination with cassava as comrade crop did not alter the yield of groundnut and sesame. Raising groundnut as comrade cropping with cassava recorded higher LER. Coir waste applied at 10 $t.ha^{-1}$ increased the tuber and groundnut pod yields.

KEY WORDS : Comrade crop, coir waste, amendments, complementarity, tuber yield

Cassava is cultivated in about 0.48 lakh hectares in Tamil Nadu with a production of 1.5 million tonnes of tuber annually contributing about 42 per cent of national production. Even with the higher contribution to the national cassava production, the productivity (10.25 tonnes ha^{-1}) is far below the normal productivity (19.33 tonnes ha^{-1}) (FAO, 1988) as well as the maximum (40 tonnes ha^{-1}) potential productivity. Inadequate provision of inputs like water and nutrients are the probable reasons for the low productivity. Any attempts to develop a package for efficient irrigation and moisture management may pave way for increasing the productivity of cassava. Cassava being a wide spaced crop with a low initial establishment and canopy coverage provides scope for raising short duration crops at early growth stages particularly under irrigated condition. With a view to accommodate the full population of cassava as well as intercrops, the concept of comrade cropping is being followed. Bulky organic manures like farm yard manure and coir industrial wastes may play an important role not only in improving the physical and chemical condition of the soil but also in providing an ideal source of plant nutrient as well as for moisture conservation. In this context an attempt has been made to combine the effect of scheduling since little research has been carried out. Therefore, a study has been formulated to quantify the effect of irrigation and moisture conservation practices on soil moisture depletion pattern and yield of cassava comrade cropping systems.

MATERIALS AND METHODS

The first experiment during December 1991 to September 1992 and the second experiment during 1992-93 were laid out in field No. 37 E of Eastern

block and in Field No. R 1 of Cotton Breeding Station, Tamil Nadu Agricultural University, Coimbatore 641 003, respectively. The soil of the experiment site was deep and clayey with moderately well drained condition. The soils were low in available N (203 and 126 kg/ha), medium in available P (18.7 and 15.2 kg/ha) and high in available K (560 and 480 kg/ha). Cassava variety CO 2 with a duration of nine months was selected for this study. Groundnut CO 1 maturing in 105 days and sesame CO 1 with a duration of 90 days were included in this study.

Treatment details

Treatments on irrigation regimes were designed by taking into account the limited water resource situations. Three irrigation regimes based on irrigation water requirement and pan evaporation values were fixed with a view to study the effect of moisture stress and to optimize the irrigation requirements. Comrade cropping was included to study the possibility of including full population of both base and intercrops for additional benefit. In the second experiment, considerable importance was given to study the moisture conservation efficiency of organic amendments with suitable comrade cropping system in cassava with varied irrigation regimes.

Experiment I

Irrigation regimes in vertical strips

I_1 : 0.30; I_2 : 0.45 and I_3 : 0.60 IW/CPE ratio with 5cm depth of water.

Comrade cropping in horizontal strips

C_1 : Sole cassava under 80 x 60 cm spacing ; C_2 : Sole cassava under 60 x 80 cm spacing ; C_3 : Sole groundnut under 30 x 10 cm spacing ; C_4 : Sole sesame under 30 x 30 cm spacing ; C_5 : Cassava + groundnut under 60 x 80 cm spacing and C_6 : Cassava + sesame under 60 x 80 cm spacing.

Experiment II

Irrigation regimes in vertical strips

I_1 : 0.30; I_2 : 0.45 and I_3 : 0.60 IW/CPE ratio with 5 cm depth of water.

Organic amendments and comrade cropping in Horizontal strips T_1 : Farm Yard manure 12.5 $t.ha^{-1}$; T_2 : Coir waste 5 $t.ha^{-1}$; T_3 : Coir waste 10 $t.ha^{-1}$ S_1 : Sole cassava and S_2 : Cassava + groundnut.

The experiment I was laid out in strip plot design with five replications. Irrigation regimes were accommodated in vertical strips and comrade cropping in horizontal strips. Experiment II was laid out in strip plot design with three replications. accommodating irrigation regimes in vertical strips and organic amendments and comrade cropping in horizontal strips. The gross plot was 4.8 m x 4.8 m adopting the spacing according to the treatment schedule. The net plot was 4 m x 4 m after discording borders in all the four sides of the plot. The cassava setts planted on the top of the ridge with a spacing of 80 x 60 and 60 x 80 cm. The groundnut and sesame seeds were sown on both the sides of ridge 60 x 80 cm with a plant spacing of 10 cm and 30 cm, respectively. The recommended package of practices were followed for cassava, groundnut and sesame for raising a crop. For recording the following observations, five plants at random from net area of each plot were selected. Based on Tuber yield of cassava, pod yield of groundnut, seed yield of sesame, Land equivalent ratio (LER) was calculated (Mead and Willey, 1980).

RESULTS AND DISCUSSION

Effect of irrigation regimes on yield

Irrigation management significantly influenced the cassava tuber during both the experiments. Irrigation given at 0.40 (I_2) and 0.6 (I_3) IW/CPE ratio produced higher tuber yield compared to 0.3 (I_1) IW/CPE ratio (Tables 1, 2). Decrease in the synthesis of metabolites, reduction in translocation of nutrients from soil to plant and within plant, decrease in cell division and elongation could be considered as the main cause of depression in the grain yield of sorghum plants at longer irrigation intervals. This could be realised in the tuber yield of cassava irrigated at 0.3 (I_1) IW/CPE ratio in both the experiments. The increase in tuber yield under I_2 and I_3 over I_1 were 25.9 and 28.3 per cent during first experiment and 22.5 and 23.3 per cent during second experiment, respectively.

The pod yield of groundnut was significantly influenced by the irrigation levels. Favourable and adequate moisture availability with higher irrigation regime (0.6 IW/CPE ratio) during first year of experimentation (Table 1) and 0.6 as well as 0.45 IW/CPE ratio during the second year of experimentation (Table 2) resulted in higher yield of groundnut. This indicates the favourableness of frequent irrigation on the yield of groundnut raised as comrade cropping.

Irrigation levels significantly influenced the seed yield of sesame (Table 1). Favourable and optimum irrigation regime (0.45 IW/CPE ratio) resulted in hihger seed yield of sesame. This indicates that higher moisture regime (I_3) as well as lower moisture regime (I_1) drastically reduced the yield, since the crop is very sensitive to higher moisture and due to lack of nutrient uptake and improper crop growth and development under water stress. The findings are in confirmity with the findings of Paterl and Singh (1979).

Effect of comrade cropping on yield

Raising casava as comrade cropping in groundnut significantly influenced the yield in both the crops (Tables 1, 2). But raising sesame as comrade cropping in cassava dratitiscally reduced the tuber yield in the first year (Table 1). This might be due to deleterious effect of sesame (allelopathic effect) which could have affected the cassava and not recovered subsequently. Raising groundnut as comrade cropping cassava did not alter the groundnut pod and haulm yield compared to sole groundnut in both the years of experi mentation (Tables 1,2). This might be because of initial slow growth of cassava and which could not have competed with groundnut for resources.

The seed yield and stalk yield of sesame were not affected by raising sesame as comrade cropping in cassava (Table 1) during the first year of experimentation, because the cassava crop had taken 105 days to cover the land area fully. By this time, the sesame completed its life cycle. So, the competition for resources by the cassava was minimised during early crop growth stage.

Effect of amendments on yield

Incorporation of coir waste at 10 $t.ha^{-1}$ (T_3) recorded significantly increased tuber yield of 39.1

Table 1. Effect of treatments on land equivalent ratio (LER)

Treatment	Cassava Tuber Yield ($Kg\ ha^{-1}$)	Groundnut pod yield ($Kg.ha^{-1}$)	Sesame Seed yield ($Kg.ha^{-1}$)	LER
Irrigation				
0.30 IW/CPE ratio				
Cassava (80 x 60 cm)	24400	-	-	-
Cassava (60 x 80 cm)	24100	-	-	-
Sole Groundnut	-	1057	-	-
Sole Sesamum	-	-	720	-
Cassava + Groundnut	22800	964	-	1.90
Cassava + Sesamum	16500	-	680	1.62
0.45 IW/CPE ratio				
Cassava (80 x 60cm)	31700	-	-	-
Cassava (60 x 80cm)	31100	-	-	-
Sole Groundnut	-	1703	-	-
Sole Sesamum	-	-	857	-
Cassava + Groundnut	30200	1639	-	1.94
Cassava + Sesamum	21700	-	800	1.63
0.60 IW/CPE ratio				
Cassava (80 x 60cm)	34000	-	-	-
Cassava (60 x 80cm)	34200	-	-	-
Sole Groundnut	-	2047	-	-
Sole Sesamum	-	-	602	-
Cassava + Groundnut	33600	1973	-	1.94
Cassava + Sesamum	25100	-	542	1.63
CD (P = 0.05)				
Irrigation	194	91.8	345	-
Comrade cropping	177	NS	NS	-

Table 2. Effect of treatments on land equivalent ratior (LER)

Treatments	Cassava Tuber Yield (Kg ha^{-1})	Groundnut yield (Kg.ha^{-1})	Sole Groundnut Yield (kg.ha^{-1})	LER
Irrigation				
0.3 IW/CPE				
Cassava+FYM 12.5t.ha^{-1}	31700	-	1661	-
Cassava+Groundnut+FYM 12.5 t.ha^{-1}	31200	1608	-	1.95
Cassava+Coirwaste 5 t.ha^{-1}	30900	-	1619	-
Cassava+Groundnut+Coirwaste 5 t.ha^{-1}	30200	1560	-	1.94
Cassava+Coir waste 10 t.ha^{-1}	33100	-	1764	-
Cassava+groundnut+Coirwaste 10 t.ha^{-1}	32600	1738	-	1.97
0.45 IW/CPE				
Cassava+FYM 12.5 t.ha^{-1}	39900	-	2152	-
Cassava+groundnut+FYM 12.5 t.ha^{-1}	39800	2098	-	1.97
Cassava+Coir waste 5 t.ha^{-1}	39500	-	2117	-
Cassava+groundnut+Coirwaste 5 t.ha^{-1}	39100	2064	-	1.96
Cassava+Coir waste 10 t.ha^{-1}	42800	-	2364	-
Cassava+groundnut+Coir waste 10 t.ha^{-1}	42600	2308	-	1.98
0.6 IW/CPE				
Cassava+FYM 12.5 t.ha^{-1}	40800	-	2217	-
Cassava+groundnut + FYM 12.5 t.ha^{-1}	40600	2155	-	1.97
Cassava+Coir waste 5 t.ha^{-1}	40500	-	2189	-
Cassava + groundnut + coirwaste 5t ha^{-1}	40300	-	2419	1.98
Cassava+Coir waste 10 t.ha^{-1}	43100	-	2419	-
Cassava+groundnut+Coir waste 10 t.ha^{-1}	43000	2359	-	1.98
CD (P = 0.05)				
Irrigation	61	89.2	-	-
Comrade cropping	NS	-	-	-
Soil amendments	62	40.3	-	-

t.ha^{-1} compared to 37.6 t.ha^{-1} for FYM 12.5 t.ha^{-1} (T_1) and 36.8 t.ha^{-1} for coir waste 5 t.ha^{-1} 5 (T_2) (Table 2). The positive effect of coir waste on yield might be possible due to better soil physical conditions which promoted the infiltration rate in the soil with increased water holding capacity and better nutrient availability and uptake by the crop.

Though the addition of plant nutrients like N, P, etc. was meagre quantitites through coir waste application, the release of plant nutrients from soil pool into available form through mineralisation might be high due to the decomposition of coir waste in the soil which could have contributed significantly for higher tuber yield. Improvement on the soil physical properties and increase in crop yield due to coir waste application had been well established by earlier workers (Durai and Rajagopal, 1983). Coir waste applied at 10.5 ha^{-1} (T_3) recorded significantly higher pod yield of 2135 kg.ha^{-1} compared to 1945 kg with FYM 12.5 t.ha^{-1} (T_1 and 1920 kg in coir waste at 5 t.ha^{-1} (Table 2).

Land equivalent ratio

In the first experiment, irrigation did not have any influence on LER, whereas raising groundnut as comrade cropping with casava (C_5) recorded higher LER compared to sesame raised as comrade cropping in cassava (C_6) in all the three levels of irrigation. In the second experiment also, irrigation did not influence the LER. But raising groundnut as comrade cropping with cassava (S_2) recorded higher LER. However, the advantage of application of coir waste at 10 t.ha^{-1} (T_3) was realised by recording numerically increase in LER over other two (T_1 and T_2) amendments.

The complementary effect of groundnut as comrade cropping in cassava could be realised with higher LER. Tangglum *et al.* (1992) reported that intercropping cassava with groundnut, mungbean and soybean produced the highest LER which is in agreement with the present investigation. However, the competitiveness of sesame with cassava even as comrade crop was expressed through lower LER

compraed to casava + groundnut comrade cropping. The advantage of raising cassava + groundnut comrade cropping was clearly brought out with application of coir waste at 10 $t.ha^{-1}$.

REFERENCES

DURAI, R. and RAJAGOPAL, A. (1983). Coir waste and press mud utilization for groundnut production. **Proc. of National Seminar on Utilization of Organic Wastes.** Agric. College and Res.Instt., Madurai, Tamil Nadu.

FAO, (1988) **Production Year Book 42**: 141-142.

MEAD, R. and WILLEY, R.W (1980). The concept of a Land Equivalent ratio and advantages in yield from intercropping. **Exptl. Agric., 16**: 217-228.

PATEL, J.C. and SINGH, R.W (1979) Water use and yield of sunflower as influenced by irrigation, mulch and cycocel application. **Madras Agric.J., 62** : 777-782.

TANGGLUM, A., VIEHUKIT,V. JANTAWAT,S. SITIBUSAYA,C. TIRAPORN,C. SINTHUPRAMA,S. and HOWELER,R. (1992). Recent progress in cassava Agronomy Research in Tailand. In: **Regional Workshop on Cassava Breeding, Agronomy and Utilization Research in Asia, (Howler, R. ed.)** : Malang, Indonesia. 1990. Bankok, Tailand, Centro International on Agriculture Tropical, Centro International on Agriculture Tropical. Regional Cassava Program for Asia. pp. 199-123. En., Summ. Fn., 6 Ref., 11. I.C. Classification. SB. 211-C3 C452.

(Received : August 1995 Revised : April 1996)

Madras Agric. J., 84(2): 63-65 February 1997

COMBINING ABILITY STUDIES ON OIL CONTENT IN RELATION TO FUZZ GRADES IN COTTON

P.NAGARAJAN

School of Genetics
Tamil Nadu Agricultural University
Coimbatore 641 003

ABSTRACT

The seeds of *Gossypium* are usually fuzzy of different grades. The combining ability on oil content in relation to fuzz grades is reported in this paper. Seven cotton lines differing in fuzz grade from fully fuzz to naked seeds were crossed with the fuzzy varieties: MCU.5, MUC.7, MCU.9 and LRA. 5166 in a 'line x tester' fashion. Seed oil percentage exhibited greater range of variation among hybrids (16.55 to 23.58). The naked seed parent, TCH.89/7 recorded the highest significant oil percentage (23.66) and hybrids involving naked seed parent also recorded significantly higher oil percentage. Heritability (broad sense) was as high as 94.6 per cent though, the genetic advance as percentage of mean was low (8.49%). The GCA/SCA ratio was also less than unity indicating the preponderance of non-additive gene action for oil content. Significant relationship between the *per se* performance and *gca* effects of the parents for oil content was noticed with sparsely fuzzed line TCH.65/8 and naked seed line TCH.89/7. But the cross combinations with high *sca* effects with respect to oil content involved poor conbiners. Correlation studies revealed that seed oil content had a significant and negative correlation co-efficient (-0.34) with fuzz grade and had significant and positive correlation co-efficient (0.34) with single seed kernel weight.

KEY WORDS : Cotton, *Gossypium hitsutum*, seed, oil content combining ability

Though cotton seed yields oil with high protein and oil cake is a good feed for animals, only in 1970s, effrots were made to incorporate desirable genes for high oil in cotton. Williams (1906) succeeded in increasing oil content in the seeds of upland cotton in North Carolina by 4 per cent. Rast (1917) noted the existence of significant differences for seed oil in different cotton cultivars and that they were transmitted from generation to generation. Christidis and Harrison (1955) reported that varieties having naked seeds are superior in oil content. India produces as much as 2.6 million tonnes of cotton seed each year. An increase in the seed oil of Indian cultivars would help to meet the annual shortage of nearly a million tonnes of edible oil, which would cost Rs. 8000 million (Dani, 1984). The present study was undertaken to obtain information on general and specific combining ability effects, heritability and genetic advance as percentage of mean for oil content and the nature of association between key characters so that an appropriate breeding methodology for the development of improved lines with respect to oil content could be developed.