VII^th Symposium of the International Society for Tropical Root Crops,
Gosier (Guadeloupe), 1-6 July 1985, Ed. INRA, Paris, 1988.

THE PERFORMANCE OF MAIZE/YAM INTERCROP GROWN WITH REDUCED LABOUR INPUT, USING HERBICIDAL WEED CONTROL AND NO STAKES

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SUMMARY

Yam being grown without stakes and with herbicide weed control (ametryne 4 kg a.i./ha + paraquat 1 kg a.i./ha) was intercropped with maize. The intercropping situation resulted in increased lodging of the maize, a lower number of cobs per plot, and a lower maize grain yield per hectare. Yam yield, however, was not significantly altered by intercropping. The land Equivalent Ratio for the intercropping situation was 1.62, indicating that intercropping, under these circumstances, was beneficial.

In a subsidiary experiment, it was found that large bulbils (over 100 g) yielded significantly less underground tuber than small (under 50 g) or medium (50-100 g) bulbils.

The implications of these and foregoing results for reducing the labour and cost of yam production, are discussed.

RESUME

Une culture d'igname non tuteurée, avec désherbage chimique (ametryne 4 kg m.a/ha + paraquat 1 kg m.a/ha) a reçu du maïs en intercalaire. Cette association provoque l'accroissement de la verse, la réduction du nombre d'épis par parcelle et du rendement en grain du maïs à l'hectare. Par contre l'association ne modifia pas significativement le rendement de l'igname. Le rapport d'équivalence des surfaces (LER) pour la culture intercalaire a été de 1,62, traduisant l'avantage de la culture intercalaire dans ces conditions.

Une expérimentation subsidiaire montre que de grosses bulbilles (plus de 100 g) produisaient significativement moins de tubercules souterrains que des bulbilles petites (moins de 50 g) en moyenne (50-100 g).

Les implications de tous ces résultats dans la réduction de la main d'oeuvre et celle du coût de production de l'igname sont discutées.

INTRODUCTION

Faced with the laboriousness and high cost of yam production, the authors (assisted by a grant from the International Foundation for Science, Stockholm, Sweden) embarked on a series of experiments with the overall aim of reducing the labour and cost of yam production. The first set of experiments led to a labour-saving production package in which herbicidal weed control was combined with the absence of staking (ONWUEME & FADAYOMI, 1980). the package was refined further to show that nett yield per hectare was highest for large (300 g) setts at close spacing (30 cm), while reproductive coefficient was highest for small (100 g) setts (ORIUWA & ONWUEME, 1980).

This paper reports two further sets of experiments in the series. The first attempts to evaluate the newly-developed production package in the context of inter-cropping, which is still the prevalent practice among yam-growing farmers. The objective therefore was to evaluate whether the new yam production package (using herbicides and without staking) was efficaceous where the yam was intercropped with maize.

Where yam cultivars normally grown for tuber also produce bulbils, it is possible to use the bulbils for commercial propagation, thus saving the tuber for consumption and reducing overall production costs for yam. It has been reported that larger bulbils produce healthier plants (MARTIN, 1974) and presumably higher yield, but the few experiments that have been reported have been concerned with *Dioscorea bulbifera* where the bulbil is the main aspect of yield. The second set of experiments here reported, therefore, aimed at ascertaining the influence of the weight of the planted bulbil on the yield of underground tuber realized, using a cultivar of *D. alata* in which the tuber is the main economic product.

MATERIALS AND METHODS

Setts of water yam (*Dioscorea alata* L. cv TDa 291) weighing 225 g each were planted at a spacing of 0.5 m on ridges that were 1 m apart. Two weeks after planting, a tank mix of paraquat at 1 kg ai/ha and ametryne at 4 kg ai/ha was applied to the plots. Three weeks after the yam was planted, maize (*Zea mays* cv FARZ 34) was planted between the yams. In other treatments, maize was planted on plots that had been treated with the herbicides, but had no yams in them, and on plots that had neither yams nor herbicides. Maize planting was at spacing of 0.3 m on the slopes of the ridges. Initially, about four maize seeds were planted per hole, but these were thinned down to two plants per stand when they were three weeks old. The control yam plots had been treated

with herbicide, but had no maize planted on them. A randomized complete block experimental layout was used, with each plot consisting of six ridges of length 7.5 m. Thus each plot contained 90 yam setts and/or 150 maize stands. The experiment was replicated four times.

No staking was done ; and except for those maize plots that had no herbicide, no weeding was done. Observations for degree of lodging in the maize were made when it was 8 weeks old. Maize was harvested at 19 weeks after sowing ; it was sun dried for 5 days, shelled, and then samples of it were oven-dried ar 80°C to constant weight. Yam was harvested at 27 weeks after it was planted.

In the second set of experiments, bulbils were collected from existing plots of water yam (*Dioscorea alata* cv *Aponmapondenu*) and sorted into small (0-50 g), medium (51-100 g) and large (over 100 g) sizes. They were then planted out according to size classes and grown to maturity. The tubers were then harvested and weighed.

RESULTS & DISCUSSION

The results of the first set of experiments are presented in Table 1. Intercropping maize with yam resulted in a greater incidence of lodging of the maize, probably due to the yam vines which were climbing on the maize stalks. The number of cobs per plot as well as the yield of maize grain per plot were also reduced as a result of intercropping. It is probable that the reduced grain yield was partly due to the increased lodging and partly to the reduced number of cobs.

The yield of sole maize grown with or without herbicide did not differ significantly from each other. This implies that this particular herbicide combination might be suitable for routine maize production.

In contrast to maize, yam yields were not depressed by the intercropping situation, since the difference between the yields of intercropped yam and sole yam were not significant.

using the sole maize grown with herbicide as a basis, the relative yield of maize in the intercrop was 0.54 while that of yam was 1.08, thus giving a Land Equivalent Ratio (L.E.R.) of 1.62. This implies that with the production package used, the intercropping was considerably more advantageous than growing each of the crops alone.

Table 1 : Performance of intercrop of maize and unstaked yam with herbicidal weed control

Treatment	% lodged maize plants	No. of cobs per plot	Sun-dry wt. of shelled maize		Oven-dry of shelled maize		Yam yield	
			kg/plot	kg/ha	kg/plot	kg/ha	g/plot	kg/ha
Yam + herbicide	-	-	-	-	-		25482	5663
Yam + herbicide + maize	80	60	4.35	967	3.45	766	27505	6112
Maize + herbicide	32	103	8.05	1789	6.40	1422	-	-
Maize - herbicide	37	93	7.5	1567	5.63	1250	-	-

Relative Yield Maize = 0.54 (or 0.61)

" " Yam = 1.08

Land Equivalent Ratio = 1.62 (or 1.69)

Table 2 : Yield of tuber by various sizes of bulbil used as planting material

Size Class	Mean yield of tuber/plant
Small (under 50g)	1308g
Medium (50-100g)	1475g
Large (over 100g)	962g

The results of the experiment with bulbils are shown in Table 2. There was no significant difference in tuber yield between the small and medium-sized bulbils, but each of them yielded significantly higher than the large bulbils. This result runs contrary to the commonly-held view (COURSEY, 1976. MARTIN, 1974 ; ONWUEME, 1978) that large bulbils would yield higher. It is probable that large bulbils may result in a greater yield of bulbils, with a possible reduction in the amount of photosynthate that is stored in the tuber. Nevertheless, these results seem to suggest that small bulbils perform at least as well as larger ones if they are to be used as planting material for tuber production.

The experiments reported here, as well as the preceding ones in the series, have established the distinct possibility for less costly and less laborious yam production, even under intercropping. What is now needed is further refinement and adoption of the recommended production package.

ACKNOWLEDGMENT

The work reported here was made possible by a grant from the International Foundation for Science, Stockholm, Sweden. For this, the author is deeply grateful.

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