GENERATION OF TARO (*COLOCASIA ESCULENTA)* PLANTING MATERIAL USING TREATED SPLIT CORM APICES

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ABSTRACT

Scarcity of planting material is a problem in taro cultivation. A field experiment was conducted that compared unsplit apical corm portions ("huli") with huli split longitudinally into twò portions. There were five treatments: unsplit huli; split huli; and split huli treated with acetylene, wood ash, or coconut milk, respectively. Untreated split huli established just as rapidly as intact huli, but split huli treated with the substances established more slowly. Leaf area at 6 or 14 weeks after planting was higher for the intact huli than for any of the split huli treatments. The intact huli also yielded significantly more than each of the split huli treatments, which did not differ from one another. Split huli produced as many side corms as the intact huli, thereby making them effective for producing future planting material. The implications of the results are discussed, and it is suggested that the yields from split-huli plantings could be increased by planting them at higher density.

Keywords: *Taro, taro planting material, split taro corm, huli.*

INTRODUCTION

One of the most persistent problems in taro production is the scarcity of planting material. The problem is experienced both by the subsistence farmer and the commercial producer of the commodity, and it has placed severe restrictions on the expansion of hectarages. Larger planting pieces give higher yields (Bourke and Perry 1976), but they tend to exacerbate, rather than to solve, the perennial problem of scarce planting material. This is because the use of larger planting pieces entails using a greater quantity of planting material per hectare.

Through the use of tissue culture and other tools of biotechnology, it is possible to achieve dramatic increases in plant numbers. However, these techniques require sophisticated infrastructural support, and are unlikely to become generally available to farmers for many years to come. The search must therefore, continue for farmer-level, low technology methods of achieving reasonably rapid increase in plant numbers of taro. Various effort have previously been made in this direction. Some unpublished work at Bubia in Papua New Guinea (Akus, Niangu, Boksou & Ghodake, personal communication) involved splitting of the corm in various ways and treating them with wood ash. Soto and Arze (1986) split tannia corms transversely and longitudinally before planting the pieces, but the results were inconclusive. Moreover, there were no definite attempts to stimulate greater suckering or development of the corm pieces.

The use of the taro corm proper, whether intact or subdivided, as planting material is clearly uneconomical since the corm is the main edible part of the taro. The Pacific Islands practice of using the apical portion of the corm, with the basal portions of the petioles still attached, has much to recommend it. The search for low-technology, rapid multiplication for taro must still confine itself to the huli, without encroaching on the main body of the corm.

The objectives of these experiments were:

a. to evaluate the effect of longitudinal splitting of the huli on performance of the huli halves as planting material;

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b. to see if commonly available low-technology substances, and plant-growth hormones (namely wood ash, acetylene and coconut milk) could boost the productivity or suckering ability of split huli.

The main experiments were carried out in the field, with a back-up glasshouse experiment intended to observe the morphological and developmental effects of the various treatments.

MATERIALS AND METHODS

Suckers of taro (*Colocasia esculenta* (L.) Schott cv Nomkoi) had their corms removed 1 cm below the petiole base of the oldest living leaf. The petioles were then cut off 20 cm from their attachment to the corm. The resulting planting material made up of the apex of the corm and the bases of the petiole is called a "huli" (Onwueme 1978). Huli for the experiment were selected to be of uniform size, weighing 100-120 g and having a basal circumference of 5 cm.

For the field experiment, there were five treatments as follows:

A. Huli split longitudinally into two halves;
B. Huli split in half and fumigated with acetylene;
C. Huli split in half and dipped in wood ash suspension
D. Huli split in half and dipped in coconut milk;
E. Intact huli (not split).

Fumigation with acetylene was achieved by placing the split huli in a large bin. About 10 g of calcium carbide were placed in a small container in one corner of the bin. A few drops of water were added to the calcium carbide, and the lid of the bin was closed. The acetylene generated by the calcium carbide was allowed to incubate with the huli for about 15 hours.

Wood ash was derived from burning a mixture of tropical hardwoods. A slurry of the ash was prepared by mixing two volumes of ash with one volume of water. The bases of the huli were then dipped in the slurry for 12 hours prior to planting. Coconut milk was obtained from green coconuts. The huli were dipped in the milk for 15 hours prior to planting.

After the huli had been treated, they were planted out in the field. Field layout was a randomised complete block design, with four replications and twenty plants per plot. Spacing was 50 cm x 50 cm, giving a planting density of 40,000 setts per hectare. The soil was sandy loam, and the field had been fallow for the previous two years after a crop of sweet potato. No fertilizer was applied. The season's rainfall approximated 3200 mm. Average daily temperature was about 26°C, with average daily minimum and maximum of 23°C and 30°C, respectively. The crop was mulched with oil palm leaves, and required only one weeding throughout the season. Harvesting was done at 32 weeks after planting (WAP).

Establishment counts were taken weekly for the first four weeks after planting. A plant was considered established when the lamina of at least one leaf had completely unfurled from its rolled-up position. Leaf area was determined at 6 and 14 WAP, respectively, using non-destructive methods. At 6 WAP, leaf area was determined by use of a transparent sheet ruled into 2 cm x 2 cm squares. The sheet was placed over each leaf and the number of squares counted. At 14 WAP, leaf area was estimated by measuring the distance from the leaf apex to the point of junction between the petiole and the lamina, and then using the formula outlined by Bourke *et al.* (1976) to calculate the leaf area.

The field experiments were supported by a glasshouse experiment, performed four times, in which the effects of the various treatments on the growth and development of the huli were observed. The various treatments were as follows:

a. split-huli fumigated with acetylene for 2 or 5 days and then kept with the basal portion dipping in water indefinitely;

b. split-huli dipped in coconut milk for 2 or 5 days and then kept in water;

c. split-huli kept in water for 3 days, then acetylene or coconut milk for 2 days and then back to water;

d. split-huli kept in water indefinitely;

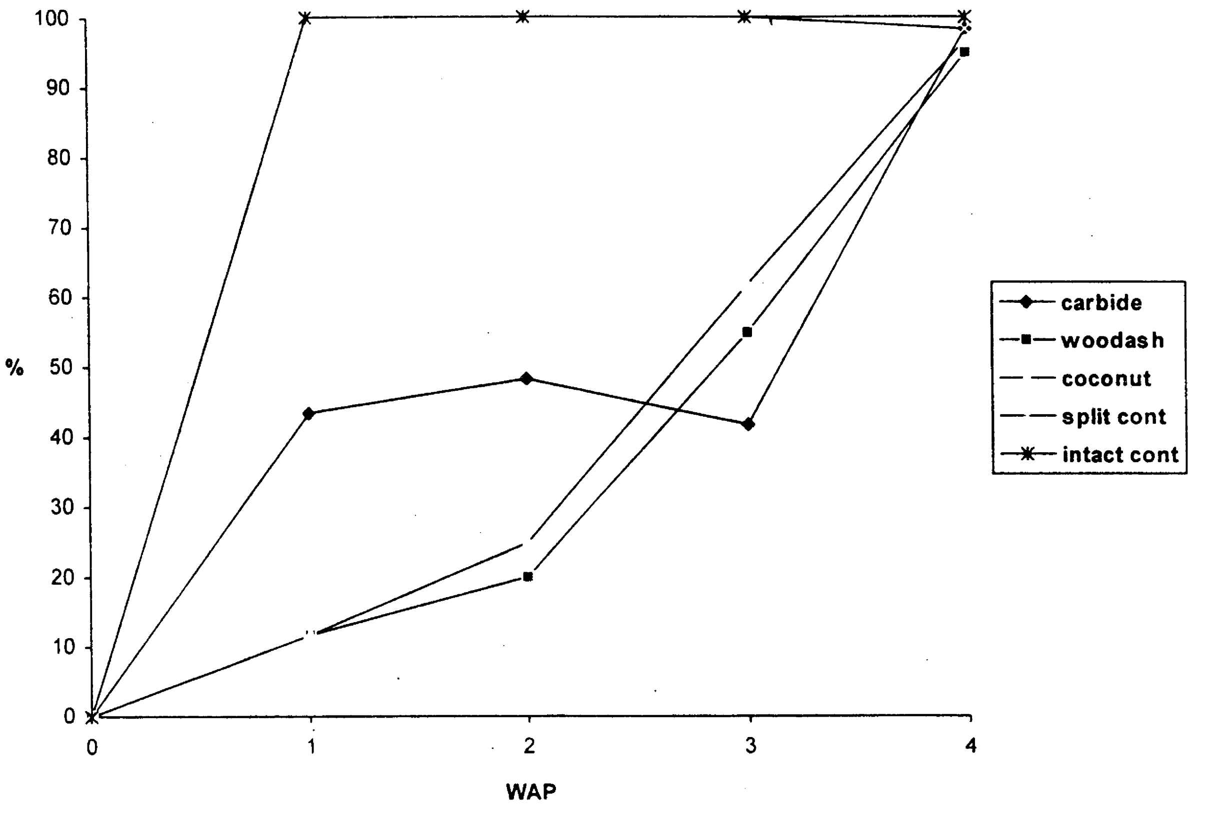
e. Intact huli kept in water indefinitely.

RESULTS

Establishment

The patterns of field establishment for the various treatments are shown in Figure 1. The acetylene,

Figure 1. **Pattern of field establishment (defined as the unfurling of at least one leaf lamina on the plant) at various times after planting. The number of established plants is expressed as a percentage of the total number of setts planted.**



wood ash and coconut milk treatments retarded field establishment. While the untreated split huli and the untreated intact huli achieved 100% establishment by 1 WAP, the other treatments did not reach a comparable level of establishment till after 4 WAP. This suggests that splitting *per se* did not delay the establishment of the huli, but that the other superimposed treatments caused a delay in establishment.

Leaves and suckers

In both 6 WAP and 14 WAP, the intact huli had a significantly higher leaf area than the other treatments (Table 1). These other treatments did not differ significantly from one another. The number of leaves per stand at 6 WAP all the treatments, including the intact huli, did not differ significantly from one another in terms of the number of leaves per stand. The coconut milk and acetylene treatments produced more suckers (i.e. side shoots) at 14 WAP than any of the other treatments.

Yield

The yield results for the field experiments are shown in Table 2. The intact huli yielded significantly higher than

Table 1. **Leaf area, leaf number and daughter sucker numbers for the various treatments. In each column, values followed by the same letter are not significantly different from one another.**

Treatment	Leaf area/stand (cm^2) *6 WAP*	*14 WAP*	Number of leaves/stand *6 WAP*	*14 WAP*	Number of suckers/stand *14 WAP*
Split huli	137.0a	904a	2.68a	4.85a	1.0a
Split huli (acetylene)	182.4a	998a	2.26a	6.02a	1.3b
Split huli (wood ash)	262.6a	693a	2.55a	4.90a	1.0a
Split huli (coconut milk)	104.8a	989a	2.75a	4.33a	1.5c
Intact huli	438.2b	1827b	3.18b	4.68a	1.1a
Least sig. difference ($p<0.05$)	23.2	186	1.5	Not sig.	0.19

Table 2. **Yields of main corms, side corms, and total corms for the various treatments. In each column, values followed by the same letter are not significantly different from one another.**

Treatment	Main corm kg/ha	Side corm kg/ha	Total yield kg/ha	Main corm g/plant	Total corm g/plant	Side corm % of total	Number of side corms/plant
Split huli	8,242	3,660	11,900	226	327	30	21
Split huli (acetylene)	9,412	5,342	14.754	246	388	36	32
Split huli (wood ash)	8,128	4,444	12,570	243	376	34	27
Split huli (coconut milk)	7,280	2,966	10,246	206	292	28	21
Intact huli	20,388	2,282	22,670	503	599	10	23
Least sig. dif. ($p<0.05$)	3,412	Not sig.	4,866	93.3	162.4	13.4	Not sig.

all the other treatments in terms of main corm yield per hectare, main corm yield per plant, total corm yield per hectare and total corm yield per plant.

However, there were no significant differences in these yield parameters, between the various split huli treatments. The intact huli produced the lowest yield of side corms per hectare, but the differences between the treatments were not significant. The percentage contribution of the side corms to the total yield was significantly lower for the intact huli than for the various split huli treatments, but the numbers of side corms per plot showed no particular trends of differences between the treatments.

Glasshouse experiment

Observation based on the glasshouse experiments showed the following:

a. Acetylene treatment had a slightly promotive effect on the expansion and growth of the buds present on the huli.

b. In comparison with the control, root development was retarded by each of the substances used, namely coconut milk, acetylene and wood ash.

DISCUSSION

The above results have established that it is perfectly feasible to raise a crop of taro utilizing split huli pieces. Starting from a given number of huli, the number of plants is immediately doubled. Moreover, the results show that the split huli produced as many side corms as the intact huli, so its advantage for generating future planting material is maintained.

The main handicap to the use of split-huli would be in the low yield recorded. Even the untreated split-huli, which established just as rapidly as the intact huli, still yielded only about half as much as the intact huli. The low yield of all the split-huli treatments must have resulted from the low leaf area, as revealed in the results. Perhaps a strategy to improve the yield from split-huli on a hectare basis might be to plant them at a higher density than the intact huli.

The objective of identifying a farmer-level treatment to boost the performance of split huli was not achieved in these experiments. Treatment with acetylene, wood ash or coconut milk did not improve the yield and performance of the split huli over the untreated split huli.

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