A NEW METHOD OF YAM PROPAGATION

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SUMMARY

A new method of yam propagation to establish two or three stands from a single sett is described. Preliminary experiments indicate that the yields of tubers from the milked setts often exceeded yields from control setts, especially in *Dioscorea rotundata* (cv. Abi and cv. Aga) and in *D. Alata.*

RESUME

Une nouvelle technique de propagation d'igname pour faire germer deux ou trois plants á partir d'une seule bouture a été exposée. Les premiers essais révèlent que les rendements en tubercules fournis par ces plants dépassent souvent les rendements des boutures-témoins, surtout avec *Dioscorea rotundata* (cv. Abi et cv. Aga) et *D. alata.*

RESUMEN

Se describe un nuevo método de propagación de ñame para establecer dos o tres lotes de producción a partir de una sola 'estaca' de propagación. La experiencia preliminar indica que el rendimiento de tubérculos de las 'estacas' de las que se obtuvo material de propagación continuamente, a menudo sobrepasó el de las 'estacas' testigo. Lo anterior se observó especialmente en *Dioscorea rotundata* (cv. Abi y cv. Aga) y en *D. alata.*

INTRODUCTION

Haynes *et al.*[1], reviewing the importance of physiological studies in the agronomy of yams, reported experiments carried out by Chapman which showed that yams respond better to nitrogen applied at 3 months after planting than either at planting or later than 3 months after planting. Ineffectiveness of early nitrogen application was explained as being due to the flush of mineralization of nitrogen at the onset of the rains. The possibility that the tubers themselves might supply all the nitrogen necessary for early growth was not considered. It has also been observed that sometimes tubers of *Dioscorea rotundata* develop fresh tubers directly from old yam setts which fail to develop shoots and also that yam vines with well developed roots often continue to grow, though at a reduced rate when tubers are accidentally or otherwise removed if there is little damage to the roots. Further, when tubers of mature yam plants, especially those of *Dioscorea alata* and *D. cayenensis* are topped or 'milked', new shoots may develop from the yam head at the base of the old mature vine.

All these observations indicate physiological inter-relationship between shoot and the tuber growth and that detaching shoot and parent tuber at any given stage of development of the yam plant may adversely, or perhaps with advantage, affect the subsequent development in either portion. Hence we postulated that perhaps fertilizers applied to young growing yams with shoots and tubers separated might be effective in promoting yield from the shoot-derived plant while at the same time the old sett could be used to establish another yam plant. Higher aggregate yield might result in this way from a given quantity of available setts. The experiments describe an attempt to test this idea.

MATERIALS AND METHODS

1972 preliminary and observational experiment

In 1972 in the Faculty of Agricultural Sciences farm, 20 yam tubers of almost the same size from each of three yam species, *D. alata, D. Rotundata,* and *D. cayenensis* were planted in March 1 metre apart on 1 metre ridge in each plot. Six weeks later 10 of the 20 setts of each yam species were detached carefully from the growing plants and replanted on ridges in another plot at the same spacing as at first planting. At the same time, 10 new setts of each of the above species were planted on an adjacent ridge in the same plot

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as the 'milked' setts. After another six weeks, the replanted setts which have by now developed a second shoot were again detached or 'milked' from these shoots and replanted on other ridges in a third plot adjacent to which another control of 10 new setts of the same species were also planted. These operations are illustrated in Figure 1. The whole experiment was replicated twice. Harvesting was carried out in November and fresh weights of the tubers were recorded.

1973 experiments

As a result of the observations made in the 1972 experiments, it was decided to repeat the experiment in 1973 on a larger scale. This time the experiment was laid down in a split split-plot design with the following treatments:

1. Main treatments: dates of planting of controls and replanting of 'milked' setts.
   A. First date of planting of control and treatment setts (March 8th, 1973).
   B. Second date (5 weeks after first planting date) of planting of second plot of control and first removal or 'milking' and replanting of treatment setts.
   C. Third date (10 weeks after first planting date) of planting of third control plot and second milking and replanting of treatment setts.
2. Sub-treatments: movement of setts.
   (a) Control setts planted and left in place.
   (b) Treatment setts detached from vines and replanted in another location on dates specified above.
3. Sub-sub treatments: species or cultivars.
   (i) *Dioscorea rotundata* (cv. Aga)
   (ii) *Dioscorea alata*
   (iii) *Dioscorea dumetorum*
   (iv) *Dioscorea rotundata* (cv. Abi)
   (v) *Dioscorea cayenensis*

The main treatments and the associated sub- and sub-sub-plot treatments were replicated three times. Randomization and allocation of treatment followed the usual procedures for the split plot design. Each sub-sub plot consisted of four 1 metre ridges 30 metres long separated by guard rows of two 1 metre ridges on either side and two metres at each end of the plot. The yam setts of approximately the same size were planted 1.2 metres apart on the ridges. The control setts were planted on two adjacent ridges of each sub-sub plot chosen at random and the treatment setts were planted on the remaining two ridges. The planting and milking of setts followed the procedure indicated in Figure 1. Although it was planned to move the milked setts five weeks after planting date (a), delay in the starting of the rainy season caused the dates of replanting and milking on dates (b) and (c) above to be carried out at seven week intervals. Fertilizers were applied one week prior to milking and replanting of setts for each planting date. Harvesting was carried out for dates A and B on 31/10/73 and for C on 12/11/73. Fresh weights of tubers, plant population and number of tubers were recorded.

A similar experiment was carried out involving whole tubers, heads, and bottoms of tubers of *D. alata* and *D. rotundata*. Only the relevant parts of the 1973 experiment are reported here, but are described more fully elsewhere[1,3]

RESULTS

1972 preliminary and observational experiments

The preliminary experiments at Nsukka in 1972 not only confirmed the feasibility of the technique but showed that:

1. For the aggregate of all planting materials at each planting date, the control plots outyielded the 'milked' sett treatment plots.
2. For the first planting date for some planting materials, the controls outyielded the milked plants, while some 'milked' setts gave higher tuber yields.
3. At later planting dates (B and C) controls gave higher yields than milked setts, indeed some of which gave zero yields.

1973 experiments at Nsukka

The 1973 data are presented in Tables 1, 2 and 3. There were highly significant differences in tuber yield between planting dates, and among cultivars there were significant differences between controls and milked treatments.

Yields of both controls and milked setts decreased with lateness of planting. In *D. dumetorum* and

D. cayenensis many setts failed to sprout and all milked-setts decomposed at the third planting date.

Cumulative yields of milked setts (Table 2) at the second planting exceed the yields of controls at the first planting date for both *D. cayenensis* and *D. rotundata* (Abi). At the first planting date, yields of milked setts as percentage of controls ranged from 85.2 percent in *D. rotundata* (Aga) to 218.6 percent for *D. rotundata* (Abi). Yields lower than controls at the first planting date were more than made up (except in *D. cayenensis*) by yields from milked setts at the two later planting dates (B and C).

When the effects of milking are averaged over all replicates and cultivars (Table 3), the milked plants still yielded 93.9 percent of those of controls at first planting date (A), with additional yield being obtained from the replanting of the setts 44.5 percent at the second planting date (B) and 23.6 percent at the third planting date (C) of the relevant controls for those dates.

DISCUSSION AND CONCLUSIONS

This experiment, although still in its preliminary stages, demonstrated that leaving the sett attached to the vine until new tubers are developed may not be the best way to maximise yield. The great quantity of setts used in establishment of new yam plants which is a major contribution to yam production being uneconomical, could be made to provide a much greater population of plants and yield by this propagation technique. There is a possibility of further improvement of this technique by (1) pre-sprouting the yam in the barn before the first planting in the field so as to reduce time before the first milking; (2) treating the yam setts with fungicides and other chemicals to reduce the rotting (which in these trials made the third planting date or second milking uneconomical); (3) rooting (as well as sprouting) the yam vines in the nursery or barn in plastic bags or soil blocks prior to field planting; (4) partial severing of the yam heads before planting with the expectation of more rapid resprouting after milking.

There were marked differences in response to this method of propagation in different cultivars or species. It was easier to milk setts planted horizontally without damaging the roots. We think that there is little doubt that the economics of yam production can be significantly improved if the potentialities indicated by this method of propagation can be realized on a production scale.

REFERENCES

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TABLE 1

Mean yields* (kg per plot) fresh weight of tubers of five yam cultivars in relation to planting date and 'milking' of planted setts

Species or cultivars	First planting date		Second planting and milking date		Third planting and milking date		Cultivar means	
	a	b	a	b	a	b	a	b
D. rotundata (cv. Aga)	45.9	38.5	27.6	15.9	3.6	0.2	25.3	18.2
D. alata	47.5	40.8	22.1	19.0	3.1	1.8	24.3	20.5
D. dumetorum	22.0	20.3	20.9	3.7	0.4	0	14.4	8.0
D rotundata (cv. Abi)	35.6	42.2	21.2	13.8	1.7	0.4	19.5	18.8
D. cayenensis	25.7	23.5	27.0	0.3	1.5	0	18.1	8.0
Planting date means	35.2	33.1	23.8	10.6	2.1	0.5	20.3	14.7

* Mean yields are based on individual plots of 20 plants each replicated three times.

a = control
b = sett milked