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NEW INFORMATION ABOUT DIOSCOREA TRIFIDA (CUSH-CUSH YAM) SELECTION

by

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The selection of Dioscorea trifida (Cush-cush yam) presented at the VIIth Meeting of the Caribbean Food Crops Society (DEGRAS, 1969) has been developed. The date published at this session may be summarized as followad.

D. trifida is the only edible american yam which stands as a staple food crop in some places. It is also the only edible cultivated yam which give there a significant amount of seeds.

As utilised once by CAMPBELL and GOODING (1962) seeds from natural hybridization of two slightly different varieties have been sowm om 1966.

Germination reaches 40 to 50% on the 55th day after seeding and delivered a little more than 200 seedlings. From a first planting and a multiplication plot, 49 were retained for a micro-trial in lattice design. The mean yield was about a 30 T metric ton/ha of marketable tubers over 0,003 ha planted without staking.

The well-known prevalence of male clones in Dioscorea progenies (MARTIN, 1966) has been observed in our material. Nevertheless, the non flowering clones amount over 50% of the seedlings.

Examination of the multiplication plot and micro-trial results bring up interest in morphological underground characters and in speediness and duration of growth as clonal specificity.

Growth development duration and lenght of untuberized portion of roots appeared as valuable heriditary parameters. A partial maternal dominance in tuber form seemed obvious in our material.

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Selection for yield from yield performance could not be assumed before the third cultivation of new clones.

VALUABLE CHARACTERS FOR SELECTION

The following indications may be considered as intuitive or deductive proposals but even in this last acceptance limitation of time, localization and varietal experimental basis must no be forgotten.

Sexuality and Yield Biology

The first examination published in 1969 denoted no relation between sexuality and any character. A new examination and more recent datas (Table I) beginning with about half the number of flowering clones make questionable such an independance.

Male clones seem to be either more diversified at first in cycle duration or less early on a mean basis than female clones. A drastic selection could account for the identical notation in 1970.

The wide fluctuations of gross and not yield let unsatisfied with any assumption from the repeated superiority (8 out of 9 cases) of female clone. At least the question remains unsolved.

Tuber Morphology

Spheroid to clavate tubers with intermediate and fasciate types has been described since the first harvest, and remain reasonable ascribed to each clone up to 1970, slight departures being due to micro or macro-ecological conditions.

Even more interesting in regard of harvesting facilities is the dispersal of tuberized root portion. The relative stability of lenght of the untuberized part (designed as "peduncle") going from 5 to 25 cm is considered in Table II. Fair correlation coefficients are found between successive years. But the fact that between 1967 and 1969 sugnificance is not reached, supports that immediate conditions of the year before play the highest part in this character.

Seasonal Duration of Development

This character is a combines notation of leaf canopy duration and breaking of dormancy in the field. Its behaviour, as depicted by correlation coefficients, is identical to that of tuber peduncle (Table II). Early clones may be harvested within nine months.

Gross yield and Marketable Yield

The Table II give also some correlation estimations of clonal yield relative stability between years.

The high value for 1966 x 1967 is an effect of size of seed-pieces at plantation. The whole harvest of 1966 standed as seed-pieces and were highly variable according to erratic situation or growth condition of primary cultivation of the single seedling of each clone.

From these coefficients the employment of yield as a valuable estimation of clonal productivity seems actually undue in the first culture, at least on a gross yield basis.

Marketable yield permits a more confident approach of clonal productivity. Indeed, the constant positive value of correlation coefficients and the fact that each culture may be considered a new (though not entirely distinct) estimation of the same genetical population behaviour gives an opportunity of combining the coefficients for an accurate evaluation of the general stability of marketable yield through several years.

Combined estimation through $z = \frac{1}{2} \log \frac{1 + r}{1 - r}$ (FISHER in VESSEREAU, 1948) lead to following values: r' 1967 - 1970 = + o,22 of which probability stands between 0,05 and 0,10 (N' = 67) r' 1968 - 1970 = + 0,45 of which probability stands between o,22 and 0.05 (N' = 18)

Table I. - Sexuality and yield biology

YEAR	Number		Cycle duration (mean notation)		Gross yield in % control		Net yield in % control	
	♀+	♂	♀+	♂	♀+	♂	♀+	♂
1966	6	20			60	40		
1967	6	20	1,5	3,0	55	55	92	74
1968	6	20	1,0	2,0	50	28	46	20
1969	6	10	1,0	2,0	104	95	66	46
1970	5	3	1,5	1,5	72	53	54	32

Table II. - Statiscal evaluation of relative stability of four characters through five years of D. trifida hybrid clones selective multiplication.

x	y	N	Cycle duration r	Tuber Peduncle r	Gross yield r	Net yield r
1966	1967	49			+0,70**	
1967	1968	49	+0,37**	+0,29*	+0,17	+0,12
1968	1969	17	+0,69	+0,62**	-0,09	+0,43(*)
1969	1970	7			-0,03	+0,53
1970	1969	17	+0,33	+0,35		

(*) Probability between 0,10 and 0,05 * Probability under 0,05

** Probability under 0,02

These significative estimations are in accordance with the well known principle that in steady selection, low value of heritability does not preclude the utilization of characters that may seem too erratic in a short time evaluation.

Two graphics (Fig. 1 and 2) give a visual scheme of the very slow shifting of mean clonal populations yield gained in our selection. The definite progress

has been done between 1968 and 1969 cultures. The apparent shifting in population mean for gross yield between 1967 and 1968 may be a fluctuative position of the expression of this some what versatile character.

OTHER CHARACTERS

Among other observations it must be indicated that the speediness of initial growth of vine which were considered in 1969 did not give a correlative classification of clone in successive years.

Last year, cooking quality and taste preference were investigated among twelve clones. Flesh texture, coloration and firmness were included in a statiscal design operating with five tasters. In most cases clonal note dispersion were convenient. The best agronomical hybrid clone, INRA 25, found as one of the most generally appreciated.

Deseasoning ability of clone must be investigated. Indeed; a recently introduced material from French Guyana exhibited a seasonal development quite different from the usual spring to winter one. Flowering took place in March and cycle appears to be from autumn to summer.

The pluriannual and ecological stability of all these traits must be ascertained for their use in selection.

PROSPECT FOR D. TRIFIDA BREEDING

The breeding of D. trifida must now take a new departure.

The hereditary nature of several traits has been observed at the second multiplication planting.

Several characters have proved a fair stability through a number of years.

Marketable yield can be considered around the third culture as a valuable estimate of clonal productivity.

Floral biology has been investigated (DEGRAS, 1970) and though at a poor score, controlled hybrization has been obtained in 1970.

Isolated culture will bring data on genetical markers and more controlled hybrid progenies.

Nevertheless a very wide task in biological approach of this yam is always needed apart from these pragmatic efforts. What about the developmental phases of this species in regard of the schemes previously describe for a number of other species (DEGRAS, 1967, FERGUSON and HAYNES, 1970, ENYI, 1970 for instance)? What about its cytogenetical situation? We hope that in collaboration with trinidadian and puerto-rican research workers much could be added on these important lines.

S U M M A R Y

Seeds from two D. trifida clones give about 200 seedlings in 1966. Male clones were prevalent out of the minor number of flowering ones. 49 were selected in 1968, 17 in 1969 and 7 in 1970. Relations between sexuality and earliness or yield remain questionable but appeal to finer investigation. Tuber form, length of untuberized portion of root (peduncle) and cycle of development exhibited a reasonable relative stability in successive years. Marketable yield took value for selection on account of 1967 to 1970 or, better, of 1968 to 1970 integrated estimates. Thus confirmed the assumption that this character could not be evaluated before the third multiplication of seedlings through tuber planting.

Cooking quality and taste preference are now considered as well as deseasoning ability of clones.

Need of thorough studies in cytogenetic and growth biology of D. trifida is underlined.

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