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INTRODUCTION OF A SEED COLLECTION PROGRAM IN ARUBA, AND ITS RELATION TO AGRICULTURE EXTENSION

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SUMMARY

This paper describes a strategy to implement a seed collection program in Aruba and its relation to agriculture extension.

Research results on cowpea are used to illustrate the potential of the strategy and its application to germ plasm conservation and food crops production.

For descriptive purposes we have considered the characteristics of cowpea such as chemical composition of seeds, quantitative and qualitative characteristics.

As for agriculture extension the motivation, work attitude and knowledge of consumption preferences are used as basic elements.

More research is required to determine production capacity of the traditional food crops in Aruba.

INTRODUCTION

Since 1975 in Aruba there has been an increasing interest in developing the agricultural sector. One of these activities is the introduction of improved, high-yielding varieties of food crops.

The experience of the countries with highly developed agriculture where traditional land varieties were replaced by high-yielding new varieties or by new crops, causing genetic erosion, led to the subsequent establishment of gene banks.

The awareness of the need to conserve genetic resources has not as yet been fully recognized in Aruba.

Under the environment of Aruba, the year after a light rainy season usually increases the demand for local seed, despite the fact that a lot of material has been lost due to dry field conditions.

The need to begin a local seed collection and seed production program is evident to serve such objectives as:

- a. conservation of germ plasm, through establishment of a branch office with liaison to the regional genebank of CATIE, and;
- b. seed production, to meet the large demand for local seeds, because of:
 1. crop failure
 2. preference for local varieties over available imported varieties, for their cooking qualities for local dishes, e. g. okra (Hibiscus esculentus L.) and sorghum (Sorghum vulgare L.)
 3. no source of imported seeds as is the case with W. I. gherkin (Cucumis anguria L.) and bottle gourd (Lagenaria siceraria (Molina) Standl).

The crops eligible for seed collection and seed production are:

<u>Vigna unguiculata</u> (L.) Walp	-	cowpea
<u>Hibiscus esculentus</u> (L.)	-	okra
<u>Cucumis anguria</u> (L.)	-	W. I. gherkin
<u>Lagenaria siceraria</u> L.	-	bottle gourd
<u>Sorghum vulgare</u> Pers	-	sorghum
<u>Cucumis melo</u> L.	-	melon
<u>Cucurbita moschata</u> (Duch ex Lam)	-	pumpkin
(Duch ex Poir)	-	winter squash
<u>Caosicum annum</u>	-	hot pepper

To this date, research on cowpeas has received the most attention. The purpose of the research is to describe cowpea by determining its characteristics. These results are subsequently dealt with.

DESCRIPTION OF VIGNA UNGUICULATA (L.) WALP COWPEA

1. Materials and Methods

Twelve plants of 10 collection numbers were planted at distances of 0,60 x 0,80m and 1,20m between plots. Due to high losses through damage by lizards and due to the

limited number of seeds per collection, the plants for these descriptions were raised in 3" jiffypots and transplanted to the field three (3) weeks after sowing. Water was supplied through drip-irrigation (Chapping micro dripper). Bamboo stakes were provided for each plant.

2. Results

The descriptors used: a. chemical composition of the seeds
b. quantitative characteristics
c. qualitative characteristics

Table 1 shows a mean protein of the samples of 26,8% ranging from 23,75 - 31,3%. This compares favourably with figures given in literature e.g. Summerfield gives a range of 19-26% as a normal average with 35% as highest percentage found and Purseyglove gives 23,4% as the average content.

In Table 2 as can be seen leafsize, pod length and number of seeds per pod vary considerably within a sample, while seed sizes varies very little. This gives the impression that leafsize, pod length and number of seeds were influenced more by environment than seed size.

Table 3 shows that all samples collected so far have indeterminate growth habits. Practically all samples are good climbers. The seed shape and the seed color are fairly uniform.

3. Evaluation

Of the quantitative characteristics, days to flowering, pod length, seeds per pod have been reported as very heritable (Summerfield et al., 1974 review). These were confirmed at plants investigated.

Number of pods per plant has not been included as a descriptor because according to Sene & N' Diaye (1971) this characteristic has a very low heritability. On these grounds it would not be a good descriptor. This is also confirmed by Erskine & Khan (1977) who found 72,4% of total variance of number of pods per plant had to be attributed to environmental effects.

Table 1 Chemical composition of the seeds (grams/100g. seed weight)

	1	2	3	4	5	6	7	8	9	10	Pursey- glove
Water	9,5	9,5	9,5	9,7	9,5	9,5	9,5	9,7	9,5	10,0	11,0
Total protein	25,0	25,6	23,7	27,5	26,9	27,5	26,8	26,2	30,0	31,3	23,4
Crude fibre	4,5	3,9	3,8	5,8	5,2	4,2	4,3	5,4	5,3	6,8	3,9
Fat	0,9	1,3	1,0	0,9	0,4	0,9	0,8	1,7	0,9	2,0	1,3
Ash	4,0	3,9	4,5	4,1	4,1	4,6	4,3	3,7	3,7	4,8	36
Calcium	0,05	0,05	0,1	0,05	0,1	0,1	0,05	0,05	0,1	0,2	-
Phosphorus	0,06	0,06	0,05	0,04	0,03	0,06	0,03	0,05	0,04	0,03	-

Source: L.V.V. - Curacao 1982

Table 2 Quantitative characteristics of *Vigna unguiculata* (L.) Walp.

	1	2	3	4	5	6	7	8	9	10
length and leaf (mm)	111 102-148	128 89-158	126 114-143	112 90-124	104 82-124	102 82-127	104 84-127	134 102-161	122 99-154	100 87-108
width and leaf	84 1) 71-103	83 71-93	95 86-110	97 89-109	73 62-86	73 61-89	77 64-89	85 67-104	79 71-92	81 65-90
number of nodes till first flower	4,8 1) 3-7	5,8 2-10	4,8 2-10	-	3 2-4	4,6 2-7	6-2 4-10	5,2 2-9	5,6 3-8	-
number of days till 50% of the plants flower	63 177 1) 161-191	64 251 223-286	68 217 140-240	89 183 141-188	70 219 179-252	70 217 191-237	68 218 183-252	71 244 217-285	62 154 122-180	89 172 144-198
pod length (mm)	11 1) 10-11	13 11-14	10 9-11	9,9 9-11	11 1-12	11 9-12	11 9-12	13 12-14	10 9-11	9,4 9-10
number of seeds/pod	15,6 1) 12-18	15,4 8-19	17 12-20	13,4 9-17	17,2 13-20	17,6 16-20	16,1 13-19	15 11-18	12,3 9-15	12,2 8-15
length of seed (mm)	8 1) 6-10 1)	10,6 10-11	7,8 7-9	8,4 7-9	8,1 8-9	8,0 7-9	7,9 7-9	9,7 9-11	8,3 8-9	8,1 8-8,5
width of seed (mm)	6,5 1) 6-7 1)	8,7 7-8	8 7-8	6,5 6-7	7,8 7-8	7,5 7-8	6,6 6-7	7,9 7-8	6,9 6-7	6,3 5-8
weight 100 seeds (g)	14,9	27,5	17	15,4	16,6	17,1	15,8	-	15,7	14,9

Source: L.V.V. Curacao 1982
1) extremes

Table 3 Qualitative characteristics of Vigna unguiculata (L) Walp.

	1	2	3	4	5	6	7	8	9	10
color hypocotyl	red pigmentation	green	green	8 green 4 red pigm.	green	6 green 6 red pigm.	10 green 2 red pigm.	green	8 green 4 red pigm.	red pigmentation
Flower color	light purple	light purple	light purple	light purple	light purple	light purple	light purple	light purple	light purple	light purple
Growth habit	good climber	good climber	good climber	weak climber	good climber	good climber	weak climber	good climber	weak climber	good climber
Color of ripe pod	cream with purple	cream with pink	cream with pink	cream with pink	cream with pink	cream with pink	cream with pink	cream with pink	cream with pink	Cream with purple.
Seed shape	cuboid	kidney-shaped	heart-shaped	heart-shaped	kidney-shaped	heart-shaped	heart-shaped	heart-shaped	heart-shaped	cuboid
Basic seed color	beige	beige	beige	beige	reddish brown	beige	beige	beige	beige	beige
Second seed color	purple	-	-	brown	-	brown	brown	-	-	purple
Distribution second seed color	small speckles	-	-	small speckles	-	small speckles	small speckles	-	-	small speckles

Sources: L.V.V. Curacao 1983

The pod characteristics of the investigated plants except for one, all samples have smooth inflated pods and all pods show the outlines of the seeds. Summerfield et al. (1974 review) state that in dry areas cowpeas may be considered totally self fertilized; considerable outbreeding occurs only in humid areas.

For Aruba it seems reasonable to expect the collected samples to be a mixture of pure lines. This is supported by the observation that samples taken from the same location and separated by seed colour produce uniform seed colour in the next generation. The lines will differ from each other in those visible characteristics for which farmers and/or consumers have shown no specific preferences, and in invisible characteristics which farmers are not aware of e.g. nutritive value. Absence of certain phenotypes could mean that there has been selection pressure against them or that they were never present in the local material. For example determinate growth habit was only found once. It seems likely that in the traditional mixed cropping system, indeterminate types were at an advantage.

For descriptive purposes Ebong (1970) suggests observations of mature central leaflets at flowering between the third and the eighth node of the main stem. Observations made reveal that the plants investigated have a tendency to form various leafshapes on one plant. Especially the central leaflet is very variable, only two samples showed uniform central leaflets.

No literature references were found for the heritability of protein content. According to literature, cowpeas are deficient in methionine and cysteine (Summerfield et al. 1974 and Sene & N'Diaye, 1974). These can not be confirmed but is scheduled to be added to the current chemical analysis, as the investigations on cowpea are continued.

Also, the cooking quality and resistance to pests and diseases were not yet evaluated, due to lack of equipment and the necessary specialist to do so. One of the objects of the seed collection is to supply seed to the local farmers. This leads immediately to the aspect of selection criteria.

One item used, as selection criterium is the growth habit. Indeterminate types have been traditionally used for inter-cropping with sorghum. Practically all

samples collected so far show this growth habit. It will remain a good type for mixed cropping on plots planted only in the rainy season. These plots are given little attention during the growing period. Lines that start by forming a ground cover and later make good use of the support provided by the sorghum will give the best results.

For planting year round with irrigation it seems advantageous to use bush types with determinate growth habits for planting as a pure stand. Uptill now, only one sample has shown this growth habit.

As to the seed characteristics, there seems to be no preferences for certain seed colours. Large seeds are preferred over small seeds. Erskine & Khan (1977) found small seeded varieties to be less sensitive to environmental influences when studying six genotypes. This possible disadvantage of large seeded lines has to be investigated for the collection.

Nutritive values lines with a high protein content should be selected. Naturally, the selected lines should be among the highest yielding ones. For Aruba no average yield figures are available yet. Yield data will have to be collected in the field and from experimental plantings of collected material. For multiplication purpose the seed size (100 seed weight), combined with a reasonably high protein content and amount of days for 50% flowering are used.

IV. Discussion

The short term value of local seed collection for Aruba, has already been proved by the demand for local seed at the Department of Agriculture. Large amounts of seeds will have to be produced to satisfy this demand completely in the future. The less obvious long term value of conservation of germplasm should never be forgotten in favour of the short term objective of production.

As the case is in Aruba, the extension workers function is not a separate function. Most of the time the technicians or professional staff carry out the extension work.

If too much emphasis is placed upon the possibilities of new variety introductions it may, intentionally or not, create the impression that traditional varieties and crops

are worthless. To prevent this, the extension workers are included in conservation programmes so that while introducing new possibilities, they will at the same time show interest in the land-varieties by collecting seed and by stimulating the farmers to keep planting successful traditional crops. To make the collection as complete as possible all personnel of the Department of Agriculture have to be motivated continually to keep looking for material for the collection.

This means, considering the size of the Island and the number of people engaged in agriculture, that the frequency of visits should be increased to at least once a month.

This should provide ample opportunity for collecting. Both improved local varieties of traditional crops and imported varieties have to be evaluated continuously to decide which varieties should be recommended to the farmers.

New crops will have to be studied even more carefully before introduction. The result should be a recommendation providing the farmer with a balanced package of well adapted varieties of economically feasible crops.

Every one engaged in extension field work have to be fully convinced of the importance of such a balanced recommendation. Their attitude towards the genetic resource of the country will largely decide the success of the described strategy.

LITERATURE CITED

- Ebong, U.U., 1970 A. Strategies for cowpea improvement in Nigeria. Samaru Agric. Newsletter, Vol. 12 No. 1:25-27
- Ebong, U.U., 1970 B. A classification of cowpea varieties (Vigna sinensis, Emdl) in Nigeria into sub species and groups. Nigeria Agr. J. Vol. 7, No. 1:5-8
- Erskine, W. & Khan, T.N., 1977. Genotype, genotype x environmental and environmental effects on grain yield and related characters of cowpea (Vigna unguiculata L.) Walp.) Austr. J. Agric. 28:609-617

- Purseyglove, J. W., 1968 Tropical Crops. Dicotyledons
I. Longmans. Green and Co. Ltd. London
- Sene D. & N' Diaye, S. M. 1971 L' Amelioration du niébé
(Vigna unguiculata) au CNRA de Bambey: de 1959 a
1969. L' Agron. Trop., Vol. 26 No. 10:1031-1065
- Sene D. & N' Diaye, S. M. 1974 L' Amelioration du niébé
(Vigna unguiculata) au CNRA de Bambey: de 1959 a
1973
Resultats obtenu 1970 et 1973. L' Agron Trop., Vol. 29
No 8:772-802
- Summerfield, R. J., Huxley P. A. & Steele, W., 1974
Cowpea (Vigna unguiculata (L.)
Walp). Field Crop Abstract Vol. 27, No. 7:301-312
- Van den Ban, A. W. 1974 Inleiding tot de Voorlichtingskunde,
Boom Meppel, Amsterdam