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BREEDING BEANS FOR THE WEST INDIES

C.M. MESS.AEN, P. LUCAS, C. VINCENT & A. LARAQUE

Biologie et Pathologie Végétale, INRA, Ancien Moulinage
Mélas, 07400 Le Teil, MONTPELLIER

ABSTRACT

From 1970 to 88 breeding programs for *Phaseolus vulgaris* and *Phaseolus lunatus* beans were followed at the INRA Antilles-Guyane, with some breeding generations grown in France or in Haïti. They may be considered as original by the use of haitian germplasm and some european varieties as a source of genes. Progenitors from U.S.A., Hawaii were used too. Among the programs which can be considered as achieved or close to their end we can quote the following number : 1 Red-mottled beans, dwarf plants tolerant to powdery mildew and other leaf diseases, for use in Haïti under moderate fertilization (0.30.30) ; 2. Black beans, semi indeterminate plants ; tolerant to powdery mildew and other leaf diseases, for use in Haïti ; 4. Black or dark red-striped bright red beans, with bright red pods, dwarf plants for the use as fresh-shelled beans in F.W.I. ; 5. Snap beans, climbing plants, resistant either ot *Meloiogyne incognita* or to powdery mildew (for familial gardens - breeding lines in course of homogeneization), for use in f.W.I. ; 8. Double purpose beans, producing either snap beans, or red fresh-shelled beans, for familial gardens in f.W.I., climbing plants (breeding lines in course of homogeneization) ; *Phaseolus lunatus* climbing lima-beans, resistant to *Meloidogyne incognita*, able to yield 6 months.

RESUME

SELECTION DU HARICOT POUR LES ANTILLES

De 1970 à 1988 des programmes de croisements concernant *Phaseolus vulgaris* et *Phaseolus lunatus* ont été conduits au Centre I.N.R.A. Antilles-Guyane, avec suivi des descendances en France et en Haïti. Ces programmes peuvent être considérés comme originaux du fait qu'ils ont utilisé comme source de variabilité du matériel haïtien et des variétés européennes. Des parents originaires des U.S.A. et d'Hawaï furent également utilisés. Parmi

les programmes qui peuvent être considérés comme terminés ou sur le point de l'être on peut citer les programmes suivants : 1. Haricots nains à grains rouges panachés, tolérants à l'oïdium et aux autres maladies foliaires, destinés à Haïti pour une culture sous faible fertilisation (0-30-30) ; 2. Haricots semi déterminés à grains noirs, tolérants à l'oïdium et aux autres maladies foliaires destinés à Haïti ; 4. Haricots nains à grains noirs, rayés rouge, rouge profond, avec des gousses à écosser frais pour les Antilles Françaises ; 5. Haricots mange-tout grimpants, résistants soit à *Meloidogyne incognita* soit l'oïdium (pour les jardins familiaux, lignées en cours de fixation), destinées aux Antilles Françaises ; 8. Haricots grimpants à double fin, soit mange-tout soit à écosser en frais à grains rouges, pour les jardins familiaux des Antilles Françaises.
(Lignées en cours de fixation). *Phaseolus lunatus* - Poids savon grimpants, résistants à *Meloidogyne incognita*, capables de produire pendant 6 mois.

INTRODUCTION

Beans are very important for peoples living in the West Indian area, either very poor or more wealthy.

For two countries chosen as examples, Haiti and French West Indies they may account for 10 to 15 % of the individual proteic ration.

To increase the production of beans so necessary for the survival of haitian people, to increase the production of fresh shelled beans and snap beans in the French West Indies : such were the aims of breeding programs initiated during the seventies, and reinforced from 1985 to 1988 by an E.E.C projet.

We hope that this modest work will not remain useless, compared with the C.I.A.T. programs realized with much more important materials means, but will be considered as original owing to its methods and results.

PHASEOLUS VULGARIS

1. APPRECIATION OF HAITI AS A SECONDARY CENTER OF DIVERSIFICATION

The bean acreage in Haïti is about 250 000. A single glance on the markets, or better in the fields, allows to appraise the extreme diversity of the germplasm used by haitian farmers.

Very heterogenous for color, mottle, bean size, growth type, they have a common character : earliness (65 to 70 days), and photoperiodic indifference : a problable consequence of the 2 or 3 sowings the farmers want to make every year, when the Bean Golden Mosaic is not prohibitive (fig. 1).

Either from beans buyed on the markets, or from superior plants chosen in the fields, we have isolated between 1971 and 1978 50 or more interesting lines, which were sent to CIAT. Among them may be quoted :

DETERMINATE GROWTH TYPES :

«Kenscoff I», the earliest one, pink beans with red stripes, powdery mildew resistant
«Salagnac 86», 70 days, powdery mildew resistant and tolerant to other leaf diseases observed between 1 500 and 3 000 feet elevation, white and red mottled beans.

SHORT-NODE INDETERMINATE GROWTH TYPES :

Black seeded lines : «B789», very early (65 days), and «Nic. 24», a little later (70 days), powdery mildew tolerant.
Small seeded light colored lines : «Salagnac 131», the highest level of resistance to powdery mildew, and «B801», very hardy, common mosaic resistant and high yielder, small light purple beans.

POLE BEANS :

«Cap Haïtien 9.4», medium size uniform red beans, earlier, but giving similar yields, compared with best red bean climbing lines received from CIAT.

2. BREEDING OBJECTIVES

For the crosses we have made since 1971, the general aims were :
- Resistance or tolerance to environmental stresses, or diseases

- Plant, pod, and bean types wanted by consumers, and growers, either in Haïti, or in F.W.I. The results obtained were no more than empirical for climatic adaptation, tolerance to acid soil with Al or Mn toxities, tolerance to Rust and other leaf spots, or to web-blight. More scientific studies were dedicated to powdery mildew resistance.

In Haïti, people prefer large red mottled beans, which are sold at the highest price on the markets. Black beans are asked for, too. Small light purple or red-mottled beans produced by the same growers are generally consumed at home.

The three types are grown mixed together, for the sake of seed input saving, and yield regularity insurance.

People in F.W. prefer large uniform red beans, imported from U.S.A., and snap beans produced with the american cultivar «Contender». In F.W.I. climatic conditions with a very short safe dry season (February 10th March 20 th) are difficult for dry beans production. On the contrary it would be possible to sell, all the year long, fresh shell beans in their pods. This possibility adds to the importance of bean coloration and interest for breeding for attractive pod colors. During months with more than 16 inches of rain, growing pole-beans allows to escape Web-blight (However, tolerance to this disease may appear in some non-climbing lines).

3. WE HAVE USED AS PROGENITORS FOR CROSSES

- original haitian lines, like Salagnac 86 and 131, Kenscoff I, B 789...

- lines from other West Indian islands, such as «Constanza 1» (Dominican republic), «Vieux Habitants» (Guadeloupe, a red kidney-like line), «Miss Kelly» (Jamaïca).

- European lines : cultivars from Italy of Southern France, producing large and beautiful uniform red or red-striped pods, and modern varieties of french snap beans.

- North american and hawaiian, such as «Contender», «Top crop» or «Manoa wonder».

4. BREEDING PROGRAMS

We have initiated nine breeding programs, the results of the most satisfying or promising ones will be exposed below :

PROGRAM 1

Large red-mottled beans, dwarf plants, powdery mildew resistant, tolerant to other leaf diseases, for Haïti the most interesting lines obtained are :

«Kenscoff super», obtained by 3 backcrosses with «Kenscoff I» on «Constanza 1» : very early, powdery mildew resistant, red-pink mottled beans.

«Salagnac 90», from 2 back crosses with «Salagnac 86» on (Kenscoff x Constanza 1 x Kenscoff I) : very similar to «S.86», but with a better seed coloration (pink-red mottled beans).

«Azaël super», from 2 backrosses with «Salagnac 86» on «Azaël 175A» (an haitian line) : plants similar to «S.86», a very original seed coloration : nearly uniform red beans, with some small white spots.

PROGRAM 2

Black beans, semi-indeterminate plants, powdery mildew resistant, tolerant to other leaf diseases, for Haïti. Most of haitian black beans are tolerant enough to powdery mildew, but too susceptible to rust.

We have obtained from (B789 x Salagnac 131) an early, high yieding line «Salagnac 59», which behaves very well in Guadeloupe, but which our haitian partners consider as not enough resistant ro rust. They have preferred to extract pure lines from the very interesting population «Mersant», found on the slopes of the Mayaca mountain.

PROGRAM 4

Large uniform red (or black-striped red) beans, with red or red-striped pods, dwarf or climbing plants, powdery mildew tolerant, for F.W.I.

These lines were obtained from 2 crosses :

- «*Scabiola rossa*» x «Vieux Habitants» which gave : «Caricosse» (climbing) and «Caricosse nain» (dwarf).

- «(Epicerie de Sault x Salagnac 86) x Kenscoff super which gave lines called «gR» (climbing) and «NR» (dwarf).

Then the crosses : Caricosse x gR
and Caricosse nain x NR

gave climbing lines : «CgR» and dwarf ones : CNR.

Among them we can quote :
CgRI, CgRD, CNR1 (slighthy tolerant to web-blight), CNR11 and CNR28 as the more promising.

PROGRAM 5

Snap beans for consumers of F.W.I. A first cross made in 1972 :

Manoa wonderXg.8.1.2. m
(Hawaian, climbing,(a french early climbing
resistant to *Meloidogyne* line for green houses)
incognita)

from which was obtained «2.2.3.V.4», very long and straight snap beans, with a few strings, produced by very robust and early climbing plants, with roots resistant to *M. incognita* and well nodulated.

Then a succession of crosses including «Contender», «Top crop» and modern french snap beans was initiated for breeding dwarf snap beans lines, well adapted to climate and resistant to *M. incognita* was initiated. Two lines «E.3.1.» and «E.5.2.» were retained.

For familial gardens not sprayed with fungicides powdery mildew resistance is more important. We have introduced it into large flat snap beans, climbing plants, from crosses including. «Salagnac 59»,»2.2.3.V.4.», «Contender», «Top crop» and «Schoelcher» (a line of flat, white seeded climbing snap beans isolated in Guadeloupe, very similar to «Phénomène à rames»).

The best lines obtained are still in course of inbreeding.

PROGRAM 8

«Double purpose beans», producing either snap beans, or red-shelled beans, from crosses between climbing lines of the programs 4 and 5 above. This program is still in progress, this type of beans might be interesting for familial gardens visited only once or twice a week.

OTHERS PROGRAMS

Program 3 (small pink or red beans for Haïti), 6 (breeding pink or red beans combining resistances to *Meloidogyne incognita* and powdery mildew), 7 (maximum yield obtained by the reunion of large size of seeds and semi-indeterminate growth type, and 9 (introduction of BGMV resistance into early and powdery mildew resistant lines, for Haïti) are for the moment interrupted, but the breeding lines are not lost...

PHASEOLUS LUNATUS

P. lunatus is traditionnaly grown in Haïti and F.W.I. Local varieties are very late and produce more stems and leaves than pods.

American climbing lines such as «Sieva» or «Florida butter speckled» appear as well adapted to soil and climate in West indies, and earlier and better yielders than local varieties. But they develop very large root-knots induced by *Meloidogyne incognita*. Crosses between these lines and the dwarf american cultivar «Nemagreen» allowed to breed similar climbing lines, with resistance to *M. incognita*, able to survive more than 8 months and to yield during 6 months in familial gardens. We can quote the lines «Blancolune» (white seeds) and «Flageolune» (green seeds). Lines with purple-mottled seeds are in course of inbreeding.

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