



EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA - EMBRAPA

... planted in another portion of Block 122. This study has been confined to the seedling progenies. Families were examined on November 4-6, 1942.

The largest seedling families are the crosses of: F-315 x PB-186, F-176 x PB-186, F-171 x PB-186, and PB-186. Only five Eastern clones were utilized in crosses, but these appear in 20 of the 21 seedling families. Av. 49 and Av. 183 were each used in 6 combinations. Av. 183 was used in 4 crosses, Film. D-65 in 2, and GL-1 in one. Only five clones were used as male parents in all of the crosses. Two were made with Av. 183.

It should be remembered that the Eastern clone marked A was used. In some way another clone was obtained.

In the seedling families there were five families with the resistance. Most of the crosses would show some resistance, while others would not.

VINCULADA AO MINISTÉRIO DA AGRICULTURA

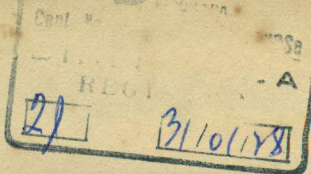
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November 4-6, 1942

The Resistance to South American Leaf Disease of
Seedling Families from the 1940 Program of Cross-
Pollinations on the Belterra and Fordlandia Estates
of the Ford Rubber Plantations

There are 21 seedling families resulting from the 1940 crosses made on Fordlandia and Belterra estates. These families are planted in Block 122 on Belterra in two plots, A and B. Some seedlings from all of the families have been cut-back to provide budwood for multiplication. Budded stumps of each family are planted in another portion of Block 122. The present study has been confined to the seedling progenies. These families were examined on November 4-6, 1942.

The five largest seedling families are the crosses of: F-351 x Av.49, F-315 x PB-186, F-176 x PB-186, F-171 x PB-186, and F-316 x PB-186. Only five Eastern clones were utilized in the 1940 crosses, but these appear in 20 of the 21 seedling families. PB-186 and Av.49 were each used in 6 combinations. Av.183 appears in 4 crosses, Film. D-65 in 2, and GL-1 in one. The Eastern clones were used as male parents in all of the crosses except two made with Av.183.

It should be remembered that the Eastern clone marked Av.49 is a false clone. In some way another clone was shipped as Av.49. However it is easy to see that this clone is not Av.49, having as it does, entirely different growth characteristics. During the 1938-39-40 crossing programs, this "Av.49" was one of the most extensively used Eastern clones because of its high yield and good characteristics in the East. The first crossing programs were to a certain extent limited to the first Eastern clones that flowered. This "Av.49" appears among some of the more resistant seedling families but their yields are still unknown.

Among the 21 seedling families there were five which appear to have considerable resistance. Most of the crosses are in the range of 5-7 and show some resistance, while only 2 families fall as low as classes 7-8. The five best crosses appear to be: F-315 x PB-186, F-4537 x Av.49, F-4542 x Av.183, F-171 x PB-186, and F-328 x Av.49. Among these crosses as in the 1941 crosses; combinations containing the Benthamiana clones F-4537 and F-4542 as female parents, are among the most resistant families.

In May 1942, all seedlings large enough were subjected to the Cramer test in order to gain some indication of the potential yielding capacity of the various families, and to determine which Eastern clones appeared to transmit most readily their capacity for high yields, to their seedling progenies. The results of this test are tabulated with each family.

The Cramer knife consists of four V-shaped blades, one above the other and approximately $\frac{1}{2}$ inch apart. These blades are mounted either on a flexible backing or on a octagonal wheel. In using the knife, the blades are forced into the bark of the young seedling at a point about six inches above the ground, by exerting a steady, even pressure until the wood is reached. Upon carefully withdrawing the knife the latex begins to flow in the cuts.

The classification of latex flow on the Cramer test is:

Class I The latex flows from cut to cut and further down along the stem.

Class II The latex flows sufficiently for connecting all or some of the cuts, but does not run down the stem.

Class III The latex runs a little further down than the lower point of the V, so that four white Y's are seen or there is at least a thick drop of latex at the end of the V-cut.

Class IV The cuts show as thick white lines.

Class V The cuts show as narrow white lines or almost not.

On the following pages the seedling families are listed in their proper order with respect to their apparent resistance to South American Leaf Disease.

F-315 x PB-186

This is the second largest family of the 1940 crosses and contains 143 seedlings. Fifty-one of these seedlings were cut-back to provide budwood for multiplication. In this large family there are six poor, small seedlings. Three of these suffer severe to complete defoliation, but the leaves remaining show little evidence of leaf disease. One seedling has dwarfed leaves while the other two have died-back.

The remaining seedlings have a very good growth, averaging 8-9 feet and there is very little South American Leaf Disease. Ordinarily there is only light spottings which causes reddish marks and some slight necrosis and deformation, with no sign of sporulation. There is only minor defoliation. Some trees are practically free from any sign of disease.

Several trees have spotting by *Catacauma Huberi* "Black Crust", which has caused some damage and defoliation on the lower flushes of leaves.

In the Cramer test made in May 1942, this family rated as follows: 5 trees a No. 1, 11 trees a No. 2, 25 trees a No. 3, 69 trees a No. 4, and 32 trees a No. 5. This family has by far the best Cramer rating, with 41 trees rating a No. 3 or better. This would

seem to indicate a seedling family of considerably better than average yielding capacity.

This family is the best of the 1940 crosses, in the opinion of the writer.

Ford scale I

Langford scale 3-4

F-4537 x Av.49

This family of 17 seedlings is an interesting cross between H. Benthamiana and false Av.49. The growth of the seedlings has been vigorous and uniform, averaging about nine feet. Two trees were cut-back to provide budwood for multiplication. The seedlings have a more dense foliage than most of the families. The leaves are rather thick and shiny; a characteristic of the leaves of the Benthamiana clones. South American Leaf Disease attacks the trees but usually only causes small reddish marks which do not form lesions. In some instances the leaves are spotted and have some necrotic lesions. There may be considerable deformation of the leaves but this does not cause defoliation. There is no sporulation and no defoliation among the seedlings of this family.

The Cramer test rated this family as: 6 trees a No. 4, and 11 trees a No. 5.

Ford scale --

Langford scale 3-4

F-4542 x Av.183

There are only seven seedlings in this family, of which three have been cut-back to supply budwood for further multiplication. The growth of the four seedlings is good, averaging 8-9 feet. Although this is a small family all 7 seedlings have a very healthy appearance. South American Leaf Disease is mostly very light though it does cause necrosis with some damage and light defoliation. There is no evidence of any sporulation. General defoliation is quite negligible.

The Cramer ratings for this family are: 6 trees a No.4, and one tree a No. 5.

Ford scale --

Langford scale 4-5

F-171 x PB-186

This family contains 112 seedlings scattered in six locations in the block. In general the family is good and seems to have considerable resistance to South American Leaf Disease. However there are individual trees which are poorer than the average. Eighteen of the seedlings have been cut-back for multiplication. The average growth of the seedlings is about 8½ feet, but some trees are only 6-7 feet tall. Defoliation ranges from light to

moderate. Many trees are nearly free from disease and have only small spots with slight necrosis and deformation but no sporulation. Some trees suffer heavier damage from the disease. These have necrotic lesions causing distinct damage and deformation, with some light sporulation. Some of the new flushes of leaves have been hit by the disease.

One seedling has dwarfed leaves. Another small tree was nearly defoliated and the remaining leaves were much damaged. The leaves showed heavy sporulation and some lesions of the petioles.

There are some leaves with light spotting by Catacauma.

Cramer ratings are as follows: 5 trees a No. 3, 48 trees a No. 4, 56 trees a No. 5.

Ford scale --

Langford scale 4-5

F-328 x Av.49

Two of these eight seedlings have been cut-back. The growth is not too vigorous, averaging about 7 feet. One seedling had it's lowest flush of leaves heavily hit by Black Crust - Catacauma Huberi - which caused some defoliation, while the remaining leaves are badly spotted and are red in color. There is a moderate amount of necrosis causing damage and deformation of the leaves. One tree exhibited some light sporulation. There is a moderate amount of defoliation.

In the Cramer test; 2 trees rated a no. 3, 2 trees a No. 4, and 4 trees a No. 5.

Ford scale I

Langford scale 4-5

F-351 x Av.49

→ Fx 25

There are 244 seedlings in this, the largest family from the 1940 program of crosses. Only 17 of these seedlings have been cut-back for budwood for further multiplication. Growth is some what variable, ranging from 6-10 feet with an average height of 8-8½ feet. With the exception of some smaller seedlings this is a family of good appearance. Four seedlings have, at some time or other, suffered die-back of the terminal shoot. Several others have dwarfed leaves but show little disease. Two seedlings have been heavily defoliated. A number of seedlings are spotted by Catacauma Huberi, but there was only slight damage except in one case where this disease had caused distinct spotting of the leaves.

Damage from South American Leaf Disease is quite variable. There are many trees whose leaves are marked only by reddish spots which cause slight necrosis and damage with minor deformation but no sporulation. Other diseased seedlings are heavily spotted and have lesions with distinct damage and deformation as well as some raggedness. In some instances light sporulation seems evident. Defoliation ranges from light to moderate.

For more trees

The May 1942 Cramer test showed the following results: 2 trees rated a No. 3, 101 a No. 4, and 117 a No. 5. These ratings do not indicate a high yielding capacity for this seedling family.

Ford scale I

Langford scale 5-6

F-170 x GL-1

Five of the 20 seedlings in this progeny have been cut-back. The growth of the remaining seedlings averages 8-9 feet. Two trees have suffered die-back. The leaves are spotted and some necrotic lesions causing deformation and raggedness are present. Defoliation is light and there is very slight evidence of sporulation. This family does not have a bad appearance when considering the family as a whole.

The Cramer test rated 5 trees a No. 4, and 14 trees a No. 5. One tree was too small to be tested.

Ford scale II

Langford scale 5-6

F-1693 x Av.49

This family is represented by 43 seedlings, 16 of which have been cut-back to provide budwood. The average growth is about 8 feet. South American Leaf Disease causes spotting and necrotic damage to the leaves. There is also considerable deformation with some raggedness. Only two seedlings showed evidence of light sporulation. Defoliation is light. The leaves are spotted by Catacauma but no serious damage resulted. In general, this family appears fairly good.

Cramer ratings of the family are: 3 trees a No. 3, 19 a No. 4, 21 trees a No. 5.

Ford scale --

Langford scale 5-6

F-1168 x Av.49

There are 15 seedlings representing this family. Eight of them have been cut-back to provide budwood. Growth of the uncut seedlings averages about 7 feet. Two of the seedlings are in poor condition. One seedling died-back but is now about 6' tall. This seedling shows spotting which has caused distinct necrosis and deformation as well as some sporulation. The second seedling, about 6' tall, has just had the growing tip killed back about a foot to the first lateral branches. Some leaves of this seedling are marked by Black Crust, which has caused some necrotic lesions. The remaining 13 seedlings are spotted and sometimes show necrotic lesions. Deformation is moderate but some leaves have a ragged appearance. These trees show no signs of sporulation. Defoliation is very moderate.

In the Cramer test, 1 tree rated a No. 3, 8 trees a No. 4, and 5 trees a No. 5.

F-4537 x PB-186

There are 22 seedlings of this cross. Growth is variable, ranging from 6-9 feet and averaging about $7\frac{1}{2}$ feet. The growth and disease resistance of this combination is poorer than that of F-4537 x Av.49. South American Leaf Disease causes spotting and necrotic lesions with heavy deformation and damage on the leaves of some seedlings. Others suffer only a light amount of disease. Defoliation is moderate. No evidence of any sporulation was found.

Nine trees rated a No. 4, and 11 trees a No. 5 in the Cramer test.

Ford scale --

Langford scale 5-6

Av.183 x F-4537

There are 46 seedlings in this progeny and 3 have been cut-back. Ten of these seedlings have a poor growth when compared with the remaining, which average 8-9 feet. One of the smaller seedlings has been defoliated. Others show dwarfing of the leaves; spotting and deformation, as well as sporulation and moderate defoliation. Among the more vigorous seedlings there is a variation in resistance to disease. Some seedlings are fairly clean while others show spotting and deformation. Necrotic lesions cause some damage and raggedness. Moderate defoliation occurs.

There is some infection by Catacauma and two seedlings have been heavily hit, causing either loss of leaves or reddening and distinct spotting.

By Cramer test of 45 of the 46 trees; 2 trees rate a No. 3, 20 a No. 4, 23 a No. 5.

Ford scale III

Langford scale 6

F-173 x PB-186

Only one of the 17 seedlings of this cross has been cut-back for multiplication. The growth of the family is very variable, ranging from 6-10 feet. One seedling has had the terminal shoot killed back, and this has stimulated lateral growth. South American Leaf Disease has caused many necrotic lesions with localized raggedness. There is also considerable leaf deformation and very moderate defoliation. No sign of sporulation was noted. There is some spotting of the leaves by Black Crust - Catacauma.

In the Cramer test of May 1942, 7 seedlings rated a No. 4 and 9 a No. 5.

Ford scale --

Langford scale 6

F-269 x F-193

The 49 members of this family are divided into 3 series distributed through the block. There is considerable difference in the trees of the various series, and for that reason they are presented separately. Series I consists of 10 seedlings having a poor growth averaging less than 6 feet. SALD causes spotting with necrotic lesions and some deformation. There is some sporulation and defoliation is severe. Series II has 25 seedlings of which 4 have been cut-back. Mostly a good, even growth. The leaves are spotted and sometimes have necrotic lesions and deformation. Defoliation is moderate and there is no sign of sporulation. In this group, 3 trees are poor. They are only 4-5 feet tall. One has died-back, and the remaining two exhibit spotting and necrotic damage with considerable raggedness. All 3 show a moderate amount of sporulation. Series III consists of 14 seedlings whose growth ranges from 6-10 feet, with about an $8\frac{1}{2}$ ' average. The general appearance is good. Some seedlings are nearly free from any disease while others have necrotic lesions causing some damage and deformation. No sign of sporulation. Moderate defoliation. Some of the seedlings are spotted by Catacauma but are not seriously effected.

The Cramer ratings of these seedlings are: 1 tree a No. 3, 22 trees a No. 4, and 22 trees a No. 5. Four trees were not large enough to test.

Ford scale --

Langford scale 6-7

F-176 x PB-186

There are 111 seedlings in this family and 15 of them have been cut-back to provide budwood for multiplication. There are six rows of this family scattered through the block. This family is not a vigorous grower and although there are a few trees 8-9 feet tall, the average height is $6\frac{1}{2}$ -7 feet. Six smaller seedlings have suffered die-back and two have been almost completely defoliated. Six seedlings have leaves which are somewhat dwarfed. In general there is moderate defoliation.

South American Leaf Disease causes some spotting and necrosis with slight damage on most trees, but some are more heavily hit; having necrotic lesions causing deformation and raggedness. On a few trees there was fairly heavy sporulation. Black Crust has caused fairly heavy spotting of the leaves on some trees.

The Cramer test gave the following results: 3 trees a No.3, 56 a No. 4, and 46 a No. 5.

Ford scale II

Langford scale 6-7

F-6520 x F-2113

There are 15 seedlings of this combination. It is a cross between H. Spruceana and Av.363. Growth is poor and the average height is about 6 feet. Several of the seedlings have suffered from die-back. Usually the disease causes necrotic lesions with distinct damage and deformation. There is also light sporulation. In a

few instances South American Leaf Disease has caused only reddish spotting of the leaves with slight necrosis. Defoliation is moderate.

On the Cramer scale, 10 trees rate a No. 4, and 5 trees a No. 5.

Ford scale IV

Langford scale 6-7

F-1395 x Av.49

Six of the 21 seedlings of this family have been cut-back for budwood. Growth is variable among the uncut seedlings, ranging from 7-10 feet. There are some seedlings which are spotted and show necrosis but have little deformation of the leaves and only minor defoliation. Other seedlings have extensive necrotic lesions causing distinct damage and deformation with consequent raggedness. One seedling gave evidence of light sporulation. The leaves of a number of seedlings were spotted by Catacauma-Black Crust.

The seedlings gave the following ratings on the Cramer test. 1 tree a No. 1, 2 trees a No. 2, 6 trees a No. 4, and 12 trees a No. 5.

Ford scale --

Langford scale 6-7

Av.183 x F-397

This family now consists of 26 seedlings; three of which have been cut-back to supply budwood for limited multiplication. Growth has been good and averages 8-9 feet. These seedlings show extensive necrosis causing distinct damage and deformation of the leaves. There is also considerable raggedness of the leaves. On a few trees very heavy sporulation was noted. One new flush of leaves had been badly hit and partially defoliated by SALD. Defoliation ranges from light to moderately severe. Six of the seedlings have suffered heavy attacks of Black Crust, which have caused some necrosis and damage.

In the May Cramer test, this family gave results ranging from 1-5 in the following order: 1 tree a No. 1, 3 trees a No. 2, 5 trees a No. 3, 12 trees a No. 4, and 6 trees a No. 5.

Ford scale III

Langford scale 6-7

F-1655 x Pilm.D-65

There is only a single tree of this cross. This seedling is about 6½ feet tall. Leaf Disease causes spotting and some deformation and dwarfing of the leaves. There is some raggedness. Defoliation is moderate. No evidence of any sporulation.

This seedling is a No. 5 on the Cramer scale.

Ford scale --

Langford scale 6-7

F-283 x Pilm.D-65

This is a poor looking family which contains only four trees. The average growth is $7\frac{1}{2}$ feet and is rather spindling. Attacks of SALD cause necrotic lesions with distinct damage and deformation. Defoliation is fairly severe. No sign of sporulation. All four seedlings rated a No. 5 on the Cramer scale.

Ford scale --

Langford scale 6-7

F-316 x PB-186

This seedling family contains 71 trees which are found in 3 series in the block. In this instance there is so much variation between the three groups that they are listed separately. Series I has 23 seedlings of very poor growth. The average height is about 6 feet. Five seedlings are nearly defoliated. One seedling has suffered die-back. SALD has caused severe necrotic damage and deformation with some raggedness of the leaves. Some new flushes of leaves have been heavily hit by disease. Heavy sporulation was noted. In many cases defoliation is rather severe. There is some light spotting by Catacauma. Series II has 12 trees of vigorous growth, averaging 9 feet. Three or four trees show very few signs of any disease, but most have spotting with deformation and distinct damage and raggedness of the leaves. No sign of sporulation. Moderate defoliation. One seedling has spots of Catacauma. Series III has 36 seedlings, one of which has been cut-back for budwood. Five seedlings are less than 6 feet tall but the average growth is about 8-10 feet. The trees of this series appear vigorous despite disease. South American Leaf Disease is very light on some seedlings but others have necrotic lesions causing damage and deformation, or in some instances a ragged appearance. No sporulation was noted. Very little defoliation.

The Cramer test resulted as follows: 3 trees a No. 3, 22 trees a No. 4, and 43 trees a No. 5.

Ford scale II

Langford scale 7-8

F-1625 x Av.183

There are but four seedlings in this progeny. Growth is slow and the seedlings average about 6 feet in height. The general appearance of the family is poor. SALD causes spotting and necrosis accompanied by deformation of the leaves. There is no evidence of any sporulation. Defoliation ranges from moderate to severe. Some small spots of Catacauma Huberi were noted.

The Cramer test of these four seedlings was: 1 tree a No. 3, and 3 trees a No. 4.

Ford scale --

Langford scale 7-8