Evaluation of FHIA hybrids in comparison with local *Musa* clones in a black Sigatoka-free area of eastern Peru

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The International *Musa* Testing Programme (IMTP) aims at comparing improved *Musa* germplasm, most notably FHIA hybrids, with popular clones in over 50 countries worldwide (Orjeda *et al.* 1999). Peru has not participated in this effort. The limited information available on *Musa* production in Peru was reviewed by Krauss *et al.* (1999) and the authors recommended germplasm trials with FHIA hybrids and popular and/or high-yielding local clones.

Diseases aggravated by almost complete lack of control measures are the most limiting factor for *Musa* production in Peru. Black Sigatoka is present in part of the production area only (Krauss *et al.* 1999). Elsewhere, yellow Sigatoka and *Cordana* leafspot are the most important diseases. Neither has received major attention from breeders because black Sigatoka is of greater importance on an international scale. In fact, few recent evaluations on yellow Sigatoka resistance are

Table 1. *Musa* hybrids and clones included for this study in a black Sigatoka-free area of eastern Peru. Disease reactions were summarized from Krauss *et al.* (1999) for Peru and, when not available, from Jones (2000).

Hybrid or Clone	Genomic make-up	Subgroup (intl. clone)	Reported disease reaction		
			Black Sigatoka[1]	Yellow Sigatoka[1]	*Cordana* leafspot
FHIA-01	AAAB	Hybrid	Resistant	nd[2]	nd
FHIA-03	AABB	Hybrid	Resistant	nd	nd
Inguiri	AAB	French Plantain	Susceptible	Moderately Resistant	Susceptible
Bellaco	AAB	Horn Plantain (Hartón)	Susceptible	Moderately Resistant	Susceptible
Isla del Alto Huallaga [3]	ABB?	Pisang Awak?	Moderately resistant	Resistant	Susceptible

[1] Krauss *et al.* (1999) reported a wide range of disease reactions by local clones to black and yellow Sigatoka. The reaction listed here represents the conclusion reached in their article.

[2] nd, no data.

[3] According to Thierry Lescot (personal communication, 1999), Isla belongs to the Iholena group (AAB). Until the affiliation of Isla to a group is confirmed, we will tentatively maintain it as "Pisang Awak?" as generally believed in Peru (Krauss *et al.*, 1999).

available because black Sigatoka replaces yellow Sigatoka except at high altitudes and existing data are highly variable. Resistance to yellow Sigatoka is not correlated with black Sigatoka resistance (Jones 2000). We found no comparative study on *Cordana* leafspot.

Yellow Sigatoka is caused by *Mycosphaerella musicola* Leach and is distributed almost worldwide. In the absence of black Sigatoka caused by *Mycosphaerella fijiensis* Morelet, yellow Sigatoka can cause major losses, especially on AAA bananas. Plantains (AAB) are resistant to yellow Sigatoka at sea level. At higher altitudes, however, especially under poor growing conditions, they are susceptible. ABB clones, including Pisang Awak, are regarded to be resistant (Jones 2000). Both the AAB and ABB groups are affected by yellow Sigatoka in Peru under poor management (Krauss *et al.* 1999).

Cordana leafspot is caused by *Cordana musae* (Zimmermann) Höhnel and is distributed worldwide. Although it is of minor importance internationally, it can cause severe defoliation especially on plantain. Wet weather and debilitated plants favour the disease. Both factors are prevalent in Peru, where up to 4000 mm of rainfall in some growing areas and the lack of drainage and sucker control as well as pests weaken the plants. *C. musae* attacks several *Musa* spp. and *Ensete glaucum*; most *Musa* subgroups are regarded to be susceptible (Jones 2000).

The objective of this study was to compare the improved hybrids FHIA-01 (AAAB) and FHIA-03 (AABB) with the local clones Inguiri (AAB, French plantain), Bellaco (AAB, Horn plantain "Harton") and Isla del Alto Huallaga (ABB, Pisang Awak subgroup?)[1] in agronomic, pathological and economical terms.

Materials and methods

The reported disease reactions of the germplasm used in this study are shown in Table 1. The trial sites and their characteristics are given in Table 2. Fields were located in the "coca-belt" of the upper Huallaga valley. All cooperating farmers actively expressed interest in participating in "alternative crops" activities and had years of experience in *Musa* production in adjacent fields. Trials were designed in a participatory manner: no attempt was made to optimize or standardize agronomic practices; these were left at the discretion of the farmer (Table 2). We believe this to be the most informative approach to germplasm evaluation under local conditions because it encompasses local crop husbandry practices. It also increases data variability; therefore, ten plants per plot were used rather than the recommended four to six. In other aspects, the INIBAP guidelines for germplasm evaluation (Orjeda 1998) were followed. Tissue-cultured FHIA hybrids were the courtesy of FHIA. After hardening in a greenhouse, the plantlets were transplanted at a spacing of 3 m x 3 m as practised for local clones. Trials followed the randomized block design with one incomplete block: Bellaco was not planted in the field in Marona.

Shortly after installation, the plot in Cotomonillo was abandoned because of terrorist activity and no data are available. Evaluation elsewhere took place in fortnightly intervals. For the plant crop, key parameters were recorded six months (182 days) after planting, at flowering and at harvest. The maximum leaf production rate was calculated from Gompertz-curves constructed by logistic regression on Genstat 5. For the ratoon crop, key parameters were recorded at flowering and harvest only. The second ratoon of Isla was compared with the first ratoon of the other cultivars because these coincided in terms of timing and, thus, the concomitant seasonal fluctuations of climatic conditions, disease pressure and marketing potential, whereas the first ratoon crop of Isla was already harvested before any of the other varieties flowered.

Results

Table 3 shows the agronomic characteristics of the *Musa* clones and hybrids in this study. Isla had the shortest production cycle with significantly fewer days from planting to flowering and harvest than the other varieties. In the ratoon crop, this phenomenon was even more pronounced. FHIA-01 had the second fastest harvest-to-harvest cycle, FHIA-03 and Inguiri were intermediate, and Bellaco had the longest harvest-to-harvest interval. Isla also had the highest leaf production rate in the plant crop although this failed to reach statistical significance. Therefore, this parameter was not analyzed for the ratoon crop.

All varieties were marginally taller at harvest than at flowering; all except FHIA-01 in the plant crop also showed a slight increase of pseudostem perimeters from flowering to harvest. Bellaco was the tallest clone, followed by Inguiri. These clones also had the thickest pseudostems. The two FHIA hybrids were in the same height range at flowering and harvest. Isla was the shortest clone with the thinnest pseudostem. Pseudostem circumference increased in the order Isla, FHIA-01, FHIA-03, Inguiri, Bellaco. This trend became more pronounced with time (Table 3).

The number of functional leaves was very similar to the total number of leaves. In the plant crop, varieties retained between 93% (Inguiri) and 100% (FHIA-03) of leaves at flowering. All retained over 98% at harvest (Table 3). This apparent "increase" in plant health over time is due to the fact that deleafing was practised during the later stages of plant development only (Table 2) so that non-functional leaves were removed more diligently closer to harvest. The more realistic indicator of disease progress is the decrease of both total and functional leaves from flowering to harvest. In the plant crop, this was most pronounced for Inguiri which lost 23.6% of total leaves and 18.1% of functional leaves between flowering and harvest. Bellaco lost

17.3% and 16.2% and Isla 15.2% and 14.3%, respectively. The least loss occurred in the FHIA hybrids: 8.3% and 7.5% for FHIA-01 and 7.2% and 9.0% for FHIA-03, of total and functional leaves, respectively. In the ratoon crop, FHIA hybrids, again, had the lowest leaf loss with 4.9% and 5.0% for FHIA-01 and 5.8% and 5.8% for FHIA-03, of total and functional leaves, respectively. The highest leaf loss in the ratoon crop was encountered for Bellaco (11.8% and 12.9%), followed by Isla (8.9% and 9.1%) and Inguiri (6.5%, both values) (Table 3).

Leaf loss was directly related to disease susceptibility (Table 4). FHIA hybrids, especially FHIA-03, were least susceptible to both yellow Sigatoka and *Cordana* leafspot whether measured as average severity or infection indices at different times. In the plant crop, Inguiri and

Table 2. Description of the farmer-managed germplasm trial plots.

Location	Planting date	Appraisal according to: Farmers	Appraisal according to: Researchers	Agronomic practices (days after planting)
Cotomonillo (Aucayacu)	19/03/98	Good *Musa* soil. Wind damage	Fertile, alluvial soil, flood-prone; 30 years under banana/plantain without fertilization, but with plant materials as mulch. Stem borer damage; Furadan used occasionally.	Not determined
Pendencia (Fondo Bazán)	19/03/98	Good *Musa* soil. Wind damage	Fairly fertile soil, flood-prone, 3rd year under *Musa* without fertilization; plant materials used as mulch; previously cocoa. Stem borer damage; Furadan used occasionally.	Weed control and deleafing (181, 234, 503) Deleafing (292, 345, 651) Borer control (Furadan) (234) Weed control, deleafing and borer control (471)
Marona	23/3/98	Fair *Musa* soil. Stem borer "Seca seca" (= Fusarium wilt)	Fertile, alluvial soils; no risk of inundation. Stem borer damage; *Fusarium* sp. has yet to be confirmed in this field. Application of lime in 1997 and Furadan in 1998. First year under banana following papaya.	Weed control and deleafing (260, 281, 425) Deleafing (325, 437, 589)
Pendencia (Fondo Magno)	16/4/98	Good *Musa* soil. Stem borer	Fertile alluvial soils; lack of natural drainage, flood-prone. Stem borer damage confirmed. First year of *Musa*.	Weed control (22, 83, 338) Deleafing (464) Weed control and deleafing (193, 263, 316, 542, 625)

Table 3. Agronomic characteristics of FHIA hybrids as compared with those of Peruvian clones

	FHIA-01 (AAAB Hybrid)	FHIA-03 (AABB Hybrid)	Inguiri (French Plantain)	Bellaco (Horn Plantain)	Isla[1] (Pisang Awak?)
Plant crop					
Days to flowering	268 b	279 b	279 b	284 b	198 a
Days to harvest	390 b	411 b	403 b	410 b	299 a
Height at flowering (cm)	239 b	233 b	268 c	311 d	201 a
Height at harvest (cm)	243 b	238 b	287 c	320 d	203 a
Circumference of pseudostem at flowering (cm)	77.3 b	88.7 b	91.7 b	109.8 c	59.4 a
Circumference of pseudostem at harvest (cm)	76.5 b	93.7 c	101.2 c	114.1 d	62.5 a
Total number of leaves at flowering	10.8 b	11.1 b	8.9 ab	8.1 a	7.9 a
Total number of leaves at harvest	9.9 b	10.3 b	6.8 a	6.7 a	6.7 a
Loss of total leaves from flowering to harvest (%)	8.3	7.2	23.6	17.3	15.2
Functional number of leaves at flowering	10.7 b	11.1 b	8.3 a	8.0 a	7.7 a
Functional number of leaves at harvest	9.9 b	10.1 b	6.8 a	6.7 a	6.6 a
Loss of functional leaves from flowering to harvest (%)	7.5	9.0	18.1	16.2	14.3
Maximum leave production rate (leaves per week)	0.28 a	0.42 a	0.41 a	0.35 a	0.64 a
Ratoon crop					
Days from flowering to flowering	278 b	286 b	283 b	296 b	150 a
Days from harvest to flowering	156 b	150 b	154 b	164 b	49 a
Days from harvest to harvest	265 b	276 bc	276 bc	298 c	149 a
Height at flowering (cm)	245 b	244 b	291 c	328 d	211 a
Height at harvest (cm)	250 b	248 b	296 c	334 d	216 a
Circumference of pseudostem at flowering (cm)	72.9 a	86.7 b	98.7 c	115.1 d	62.2 a
Circumference of pseudostem at harvest (cm)	77.2 b	89.0 c	102.0 d	115.5 e	65.5 a
Total number of leaves at flowering	10.2 b	10.4 b	7.7 a	8.5 a	7.9 a
Total number of leaves at harvest	9.7 b	9.8 b	7.2 a	7.5 a	7.2 a
Loss of total leaves from flowering to harvest (%)	4.9	5.8	6.5	11.8	8.9
Functional number of leaves at flowering	10.0 b	10.3 b	7.7 a	8.5 a	7.7 a
Functional number of leaves at harvest	>9.5 b	9.7 b	7.2 a	7.4 a	7.0 a
Loss of functional leaves from flowering to harvest (%)	5.0	5.8	6.5	12.9	9.1

[1] The second ratoon of Isla was compared with the first ratoon of the other clones and hybrids.

[a, b, c, d] Values within a row followed by the same letter do not differ at P = 0.05 (Tukey test).

Table 4. Leafspot reaction of FHIA hybrids as compared with those of Peruvian clones.

	FHIA-01 (AAAB Hybrid)	FHIA-03 (AABB Hybrid)	Inguiri (French Plantain)	Bellaco (Horn Plantain)	Isla[1] (Pisang Awak?)
Plant crop					
Yellow Sigatoka					
Average severity (%)[2]	0.54 a	0.12 a	4.09 c	0.69 ab	2.57 bc
Infection Index 6 months after planting [3]	0.53 a	0.00 a	4.37 b	0.58 a	4.36 b
Infection Index at flowering	1.09 a	0.56 a	3.55 b	0.82 a	3.73 b
Infection Index at harvest	1.67 ab	0.25 a	7.45 c	3.11 b	6.73 c
***Cordana* leafspot**					
Average severity (%)	1.21 a	0.95 a	2.00 ab	2.96 b	1.57 ab
Infection Index 6 months after planting	1.73 a	1.26 a	2.37 ab	3.62 b	2.52 ab
Infection Index at flowering	1.85 ab	0.92 a	3.01 b	2.67 b	3.00 b
Infection Index at harvest	2.28 ab	1.95 a	3.55 b	5.88 c	5.04 bc
Ratoon crop					
Yellow Sigatoka					
Average severity (%)	2.13 a	1.71 a	5.48 b	2.05 a	3.68 ab
Infection Index at flowering	1.07 a	0.79 a	3.03 a	2.15 a	3.04 a
Infection Index at harvest	1.86 a	1.27 a	2.61 a	1.07 a	3.37 a
***Cordana* leafspot**					
Average severity (%)	2.08 a	0.97 a	4.91 a	1.57 a	1.65 a
Infection Index at flowering	0.64 a	0.11 a	1.50 a	1.51 a	1.60 a
Infection Index at harvest	1.05 a	0.19 a	1.43 a	0.06 a	1.67 a

[1] The second ratoon of Isla was compared with the first ratoon of the other clones and hybrids.

[2] Calculated by multiplying percentage disease severity per leaf with percentage leaves infected and averaging this value over time.

[3] Infection indices were calculated according to Orjeda (1998).

[a, b, c] Values within a row followed by the same letter do not differ at P = 0.05 (Tukey test).

Isla were most affected by yellow Sigatoka. Bellaco was most susceptible to *Cordana* leafspot, closely followed by Inguiri and Isla. In the ratoon crop, all cultivars were affected more by yellow Sigatoka than by *Cordana* leafspot but disease severity and indices were more variable. Inguiri, followed by Isla, exhibited the highest yellow Sigatoka severity. Other parameters and *Cordana* leafspot did not reach statistical significance (Table 4). In contrast to the plant crop in which disease increased over time, in the ratoon crop, yellow Sigatoka in Inguiri and, even more pronounced, both diseases in Bellaco seem to decrease from flowering to harvest. This can be attributed to deleafing just before these clones were harvested (Table 2) and is also in agreement with the high percentage leaf loss of Bellaco from flowering to harvest (Table 3).

An economic comparison (Table 5) indicates that FHIA-03 was the overall most lucrative *Musa* variety during the first production cycle after planting. It produced the most fingers per bunch and attracted a high price, which is calculated on a per 1000 finger basis in eastern Peru. Large bunches combined with a fast production cycle made Isla the second most economical clone. In the ratoon crop, Isla surpassed FHIA-03 in terms of economics due to a remarkably fast ratooning and flowering rate (Table 3). These characteristics compensated for its susceptibility to yellow Sigatoka and a somewhat lower price. FHIA-01 was consistently the third most economical hybrid because of its large bunches and disease resistance. It fell into the same price-class as Isla. Inguiri was less profitable. Bellaco was least economical. The lower economic returns for these two plantain clones were because of their small bunches (Table 5) and high disease susceptibility (Table 4) which outweighed a high per-finger price. All varieties became more profitable in the ratoon crop, although farm-gate prices for all varieties, except Bellaco, had dropped.

Discussion

We deliberately chose a participatory approach to germplasm evaluation because we believe this to be the most realistic representation of local growing conditions. Both agronomic practices (or the lack of them) and personal preferences for a variety could be included in the evaluation. Interestingly, one farmer decided not to plant Bellaco. This clone later proved to be the worst in the overall performance. Nevertheless, the collaborating farmers were the more conscientious ones of that area with interest and experience in *Musa* production. We are aware that crop management was above the regional average.

None of the participating farmers recognized fungal diseases as limiting factors for production. Instead, they were regarded as normal leaf appearance. All growers had problems with toppling and attributed this to wind, which is negligible in the area, or weevil attack, which is ubiquitous. Average farmers do not usually recognize this pest. The complete lack of drains in flood-prone fields further contributed to weakened root systems. Nematodes were no major problem as all fields except the lost plot in Cotomonillo were only recently planted to *Musa* (Table 2). One farmer used insecticide during the duration of the trial. All practised manual weed control and deleafing. The latter only commenced about six months after planting when flowering of Isla had begun and resumed before the harvest peak of both production cycles (Tables 2 and 3). Little attention was paid to the crop during early development stages, i.e. when the bunches differentiated and the number of fingers, on which the pricing structure is based, were determined.

FHIA-01 was bred as a dessert banana substitute. It is the only hybrid with simultaneous resistance to black Sigatoka, Panama disease and crown rot. Furthermore, it is high-yielding even under poor conditions including drought (FHIA 2000). FHIA-01 tends to perform better in subtropical than tropical conditions, especially with respect to fruit quality (Jones 2000). FHIA-03 was bred as Bluggoe substitute. It is resistant to black Sigatoka and Moko disease. It is a sturdy hybrid which yields well under adverse conditions such as poor soils and drought. Its main weakness is the short greenlife. FHIA-03 is therefore recommended for homegardens and local consumption (FHIA 2000). Boiling time for cooking green FHIA-03 is only half that required for Bluggoe (Jones 2000).

In the black Sigatoka-free area where this study was conducted, FHIA-03 performed similar to the best local clone (Isla) and FHIA-01 also compared very well. The Huallaga valley is a highly tropical environment and poor drainage rather than drought is a problem (Krauss *et al.* 1999). Under these circumstances, it is gratifying to see FHIA hybrids perform so well and be accepted by local and metropolitan markets at the same time. Especially, the success of FHIA-03 is surprising. Bluggoe is not appreciated in Peru (Krauss *et al.* 1999), but farmers reported multipurpose uses for FHIA-03.

The study also indicated that Isla del Alto Huallaga is moderately susceptible to yellow Sigatoka in eastern Peru. This finding contradicts Table 1, but may help to resolve a point of contention: Isla has been classified as susceptible to highly resistant and Inguiri and Bellaco as susceptible to resistant by different authors. Krauss *et al.* (1999) concluded that Isla is resistant and Inguiri and Bellaco are moderately resistant to yellow Sigatoka but these resistance reactions are dependent on the growing conditions. All three clones are reported as susceptible to *Cordana* leafspot (Krauss *et al.* 1999). According to the plant crop data, Isla and Inguiri are similarly susceptible to yellow Sigatoka, whereas Bellaco may be less susceptible to yellow Sigatoka but more so to *Cordana* leafspot. However, in the ratoon crop, all varieties suffered more from yellow Sigatoka than from *Cordana* leafspot. The high variability of disease incidence in the ratoon crop, especially near harvesting, may be due to increased phytosanitary pruning around that time.

Isla has recently been incorporated into FHIA's breeding programme (Phil Rowe, pers. comm., 2000). It would be worthwhile to investigate whether aggressive pathotypes of *M. musicola* have evolved in the Huallaga valley and/or to corroborate the affinity of Isla clones with Pisang Awak. Isla has also been suggested to belong to the Iholena (AAB) subgroup (Thierry Lescot, pers. comm., 1999). Furthermore, "Isla" is the collective term for five to seven distinct clones within one group (Krauss *et al.* 1999). It is conceivable that their disease reactions differ.

The present trials show that the FHIA germplasm exhibits resistance to yellow Sigatoka and *Cordana* leafspot under mediocre growing conditions and management in eastern Peru. FHIA-03 was least susceptible to diseases, produced the largest bunches, and was rated in the highest price class. This suggests that this clone has excellent marketing potential for Peruvian internal markets. Bellaco commanded a similar price to FHIA-03 (for 1000 fingers), but Bellaco was the least economical because of its small bunch sizes. FHIA-01 was less popular but also has good potential. It fell into the same price class as Isla, one of the most popular clones in Peru (Krauss *et al.* 1999). Only the most favoured local clones were included in this study, and it is a great achievement for a new variety to compete with any of these on the market during the first year of planting. Participating farmers also reported good markets for FHIA planting material. However, none of them was prepared to sell followers of FHIA-03 which produces fewer suckers than FHIA-1. Instead, farmers expanded their own area under FHIA-3.

We can wholeheartedly recommend the introduction of FHIA hybrids on a larger scale in Peru, especially in view of the constant expansion of black Sigatoka. Evaluations of FHIA hybrids in areas affected by black Sigatoka are ongoing (Phil Rowe and Raul Anguiz, pers. comm., 1999).

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Table 5. Economic returns of FHIA hybrids as compared with those of Peruvian clones.

	FHIA-01 (AAAB Hybrid)	FHIA-03 (AABB Hybrid)	Inguiri (French Plantain)	Bellaco (Horn Plantain)	Isla[1] (Pisang Awak?)
Average number of fingers per bunch	120	150	84	33	110
Plant crop					
Farm-gate price (US$ per 1000 fingers)	30.03	39.04	36.04	39.04	30.03
Gross income (US$ ha^{-1} yr^{-1})[2]	3747	5778	3047	1,747	4,481
Ratoon crop					
Farm-gate price (US$ per 1000 fingers)	28.90	34.68	28.90	40.46	28.90
Gross income (US$ ha^{-1} yr^{-1})[1]	5307	7644	3567	1,817	8,653

[1] Second ratoon of Isla was compared with the first ratoon of the other clones and hybrids.

[2] Based on a planing density of 1111.11 plants per ha.

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Mentioning of trade-names is this article is not to be understood as recommendation of a particular product. ■

References

FHIA. 2000. Bananas and Plantains. <http://honduras.com/fhia/banana.htm>.

Jones D.R. (ed.). 2000. Diseases of banana, abacá and enset. CABI Publishing, Wallingford, UK.

Krauss U., R. Figueroa, A. Johanson, E. Arévalo, R. Anguiz, O. Cabezas & L. García. 1999. *Musa* clones in Peru: classification, uses, production potential and constraints. Info*Musa* 8(2): 19-26.

Orjeda, G. 1998. Evaluation of *Musa* germplasm for resistance to Sigatoka disease and Fusarium wilt. INIBAP Technical Guidelines 3. INIBAP, Montpellier, France.

Orjeda, G., J.-V. Escalant and N. Moore. 1999. The International *Musa* Testing Programme (IMTP) Phase II: Overview of final report and summary of results. Info*Musa* 8 (1): 3-10.

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