FIELD PERFORMANCE OF COFFEE PROGENIES AND CULTIVARS WITH SPECIFIC RESISTANCE TO RUST

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ABSTRACT: The aim of this research was to evaluate the yield and other agronomic characteristics of coffee progenies with specific resistance to rust. An experiment was carried out at the Experimental Farm of MAPA/Fundação Procafé (MAPA/ProCoffee Foundation) in Varginha, MG, Brazil. The experiment was set up in January 2003 in a randomized complete block design with 12 progenies and two cultivars, five replicates and four plants per plot. The characteristics of average yield, maturation stage and screen analysis were asssessed. The data were subjected to analysis of variance and when there were significant effects from treatments, the means were compared by the Scott-Knott test. For the purpose of facilitating indirect selection, we sought to investigate the degree of association of the characteristics under study by means of the estimates of phenotypic correlation among the characteristics evaluated. Subsequently, genetic distances were estimated by the generalized Mahalanobis distance method to verify the variability among progenies. The results obtained allow us to verify the existence of variation among progenies and cultivars when the characteristics are evaluated separately. It is not recommended to apply indirect selection on the characteristics assessed because the average yield of coffee grains is not strongly associated with the other characteristics. The progenies Arara planta 418 and Catucaí Amarelo 20/15 are recommended for future crosses, considering that these genetic materials are more productive than the control Catuaí Amarelo IAC 66/69 and have genetic divergence. This information may help breeding programs for specific purposes upon enabling the appropriate choice of parents.

Index terms: C*offea arabica*, genetic breeding, correlation.

COMPORTAMENTO AGRONÔMICO DE PROGÊNIES E CULTIVARES DE CAFEEIRO COM RESISTÊNCIA ESPECÍFICA À FERRUGEM

RESUMO: *Objetivando-se avaliar a produtividade e outras características agronômicas de progênies e cultivares de cafeeiro com resistência específica à ferrugem, foi conduzido um experimento na Fazenda Experimental do MAPA/Fundação Procafé, em Varginha, MG. Este foi instalado em janeiro de 2003, em blocos inteiramente casualizados, com 12 progênies e duas cultivares, cinco repetições e quatro plantas por parcela. Foram avaliadas as características de produtividade média dos grãos, estádio de maturação dos grãos e classificação por peneira. Os dados obtidos foram submetidos à análise de variância e quando houve efeito significativo dos tratamentos, as médias foram comparadas por meio do teste de Scott-Knott. Com o intuito de possibilitar a seleção indireta buscou-se conhecer o grau de associação das características em estudo, por meio das estimativas de correlação fenotípica entre as características avaliadas. E, posteriormente, para verificar a variabilidade existente entre as progênies foram estimadas as distâncias genéticas pelo método das Distâncias Generalizadas de Mahalanobis. Os resultados obtidos permitem verificar a existência de variação entre as progênies e cultivares quando as características são avaliadas de forma isolada. Não é indicado aplicar a seleção indireta nas características avaliadas, pois a produtividade média dos grãos não está fortemente associada às demais características. As progênies Arara planta 418 e Catucaí Amarelo 20/15 são indicadas para futuros cruzamentos, tendo em vista que esses materiais genéticos são mais produtivos que a testemunha Catuaí Amarelo IAC 66/69 e apresentam divergência genética entre si. Essas informações podem subsidiar os programas de melhoramento com finalidades específicas, ao possibilitar a escolha adequada de genitores.*

Termos para indexação: *Coffea arabica, melhoramento genético, correlação.*

1 INTRODUCTION

Programs for coffee genetic enhancement conducted in Brazil have provided significant changes in the history of coffee and contributed effectively to the invaluable advances in activity in Brazil.

These advances have generated basic knowledge fundamental to the constant evolution of science, beyond those of immediate application by farmers (CARVALHO, C. et al., 2008; FREITAS et al., 2007).Initially, the general objectives of breeding programs were focused

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on the development of cultivars with high yield, vigor and longevity. After 1970, with the appearance of rust (Hemileia vastratrix Berk. Et Br) and its rapid spread in crops, emphasis was placed on breeding for resistance to this disease (MIRANDA; PERECIN; PEREIRA, 2005). However, two decades before the appearance of rust in Brazil, researchers at the Agronomic Institute of Campinas started breeding programs aiming to produce resistant cultivars. This work resulted neat rows of coffee plants identified as Catimor, Sarchimor and Icatu (CARVALHO, C. et al., 2008).

Most cultivars tolerant to rust currently in cultivation as a source of resistance is the material called Timor Hybrid (BONOMO et al., 2004; Botelho et al., 2007). The resistance present in Timor Hybrid is the type specific, relationship-based gene to gene. Due to its characteristics of similarity with the cultivars of *Coffea arabica* L. and its resistance to rust, material Timor Hybrid has long been used to obtain cultivars resistant to coffee rust (CAPUCHO et al., 2009; CARVALHO, A. et al., 2008).

Besides the Timor Hybrid was used rust resistance directly from *Coffea canephora* Pierre ex A. Froehner, through artificial crossing this species with cultivar Bourbon Red (Coffea arabica), material called Icatu. Cultivar Icatu presents itself as a good option for presenting hardiness, high vigor, good production and variability for rust resistance, both specific and non-specific (Carvalho et al., 2009; CORREA; MENDES; BARTHOLO, 2006; sera et al ., 2010). The resistance of the non-specific or polygenic, it is preferable to be long-lasting, while the specific resistance can be overcome by new genotype of the pathogen. The probable natural crossing between Icatu and Catuai Yellow was obtained cultivate Catucaí. The selection in this cultivar has been made with the aim of standardizing the stature and architecture of plants (CARVALHO, C. et al., 2008).

In recent years, several varieties of Arabica coffee with rust resistance were registered with the Ministry of Agriculture, Livestock and Supply/MAPA, and recommended for commercial cultivation. However, there are no studies sufficient adaptability and evaluation of agronomic performance in various coffee regions. This finding shows the need for more studies in the area of genetic improvement (Paiva et al., 2010). In this context, the aim of this study was to evaluate the yield and other agronomic traits of progenies and coffee cultivars with specific resistance to rust.

2 MATERIALS AND METHODS

The experiment was conducted at the Experimental Farm of the Ministry of Agriculture, Livestock and Supply (MAPA) / Procafé Foundation, located in the city of Varginha, southern Minas Gerais, 21o34 ‘south latitude, 45o24’22 “and longitude average altitude of 950m. The regional climate is, according to Koppen, humid mesothermal with dry winter. The average temperature in the coldest month is 16.0 ° C (July) and 23.1 ° C in the hottest month (February).

The trial was conducted on January 20, 2003, with 12 progenies and cultivars. The progenies belong to Sarchimor (Arara planta 418 and Acauã planta 363 planta 375), group Catimor (Sabiá Tardio planta 398 planta 649, IBC-Palma 1 planta 324 and IBC-Palma 2 planta 181) and group Catucaí (Catucaí Vermelho 36/6 planta 365, Catucaí Amarelo 24/137 planta 388, Catucaí Vermelho 24/137 planta 235, Catucaí Amarelo 2 SL planta 479 planta 335 planta 755, Catucaí Amarelo 20/15 planta 479 planta 527 and Catucaí Vermelho 20/15 planta 476 planta 626). It was also evaluated the progeny Saíra, planta 557, derived from a cross between Catuaí Amarelo IAC 86 and Catindu. These progenies were selected by the pedigree method and are currently in F_5 or F_6 generation. The two analysed cultivars were Obatã Vermelho IAC 1669-20 and Catuaí Amarelo IAC 66/69. Since the Yellow Catuaí IAC 66/69 was used as a reference in order that it has a high yield (Table 1). Whereas the broad genetic base material, it is assumed that the processing progenies / cultivars is the random effect.

The deployment and conduct of the experiment were made according to the technical recommendations for the coffee crop fertilization being held as the 5th Approximation of Minas Gerais (GUIMARÃES et al., 1999).

The experiment was conducted in randomized block design with five replications and four plants per plot. The spacing adopted was 3.50 mx 1.00 m, with one plant per hill. These characteristics were the following:

Average productivity: in kilograms of “café da roça” per plant, and the harvest in July of each year. Data were collected from four harvests, seasons 2005/2006 to 2008/2009. The production was determined by weighing the fruit directly after harvesting and then a two-liter sample from each plot was weighed and placed to dry in the sun. Once dry, the coffee beans were weighed, processed and weighed again to calculate productivity in coffee sacks benefit per hectare (bags / ha).

TABLE 1 - Progenies and coffee cultivars evaluated in the experiment installed at the Experimental Farm of the MAPA / Foundation Procafé in Varginha, MG.

Order number	Progenies and Cultivars
01	Obatã Vermelho IAC 1669-20
02	Catucaí Vermelho 36/6 planta 365 (3-22)
03	Catucaí Amarelo 24/137 planta 388 (3-25)
04	Arara planta 418 (3-25)
05	Acauã planta 363 planta 375 (3-22)
06	Catucaí Vermelho 24/137 planta 235 (3-25)
07	Catucaí Amarelo 2 SL planta 479 planta 335 planta 755 (3-19)
08	Catuaí Amarelo IAC 66/69 *
09	Sabiá Tardio planta 398 planta 649 (3-25)
10	IBC-Palma 1 planta 324 (3-25)
11	IBC-Palma 2 planta 181 (3-25)
12	Saíra planta 557 (3-13)
13	Catucaí Amarelo 20/15 planta 479 planta 527 (3-25)
14	Catucaí Vermelho 20/15 planta 476 planta 626 (3-25)

* Cultivar used as control.

Percentages of cherry, green, passed, dry and empty locule beans: used a sample of 300 ml of produce each portion to obtain a percentage of fruit in each stage and also the percentage of empty locule beans, using the technique proposed by Antunes Filho and Carvalho (1957) modified.

Percentage of flat, moca and shell beans: determined as a normative statement of 2003 (BRASIL, 2003).

Percentage of beans retained in 16 above screen and beans retained in 10 moca screen: obtained from 300g of processed coffee samples. Beans were classified in intercalated screens, using for classifying as flat beans the number 13 to number 18 screens, and, as moca beans, number 10 screen.

Data were subjected to analysis of variance, the treatment effect analyzed by F test When significant effects of treatments, the means were grouped by the Scott-Knott test.

Subsequently, we estimated the phenotypic correlation (rf) between traits and also the genetic divergence among the progeny. Correlation studies have great importance for breeding programs for coffee (CARVALHO et al., 2010; TEIXEIRA et al., 2012) and may contribute, especially when selecting a desirable character is hampered by the low heritability or problems measuring and identification.

To study the genetic divergence was estimated genetic distances between lineages, using the method of generalized Mahalanobis distances. Statistical analyzes were obtained using the Computer Program GENES, at Federal University of Viçosa (CRUZ, 2003).

3 RESULTS AND DISCUSSION

Table 2 is a summary of the analysis of variance concerning the traits of the progenies and cultivars. Differences are significant at 1% probability by the F test, for most of the traits. Only for the percentage of shell-type grains, no significant effect. This demonstrates the presence of genetic variability among the progenies and cultivars, with respect to the characteristics analyzed. The data relating to the characteristics: green, passed, dry, empty locule and shell were transformed into $\sqrt{Y+1{,}0}$, since they did not show normal distribution.

Table 3 presents the results of a comparative analysis of average agronomic traits, to test for Scott-Knott.

For the average yield of progenies and cultivars were formed four groups. In the upper position the highlight was the progeny Arara planta 418 (Sarchimor Amarelo) with 50,2 sacs/ha.

TABLE 2 - Resume of the variance analysis, averages and variation coefficients for the agricultural features of the progenies and coffee cultivars.

Variation sources	GL	AVERAGE SQUARE					
		Prod.	Cherry	Green	Passed	Dry	Empty locule
Progenies/Cultivars	13	195,19*	985,96*	4,03*	8,14*	3,62*	4,85*
Residue	52	25,47	250,56	0,63	2,23	0,60	0,95
Average		37,64	63,24	3,07	4,25	2,40	3,72
CV (%)		13,40	25,03	25,86	35,20	32,27	26,19
Variation sources	GL	AVERAGE SQUARE					
		Flat	Moca	Shell	16 and above	10 moca	
Progenies/Cultivars	13	339,25*	327,61*	0,24	776,68*	301,97*	
Residue	52	40,37	39,57	0,11	65,95	11,56	
Average		77,23	21,40	1,49	48,00	18,24	
CV (%)		8,23	29,40	22,57	16,92	18,65	

* Significant at 1% probability by the test F.

Dias et al. (2005), evaluating 25 coffee progenies, obtained the formation of two groups and progeny Sarchimor IAC-4361 also stood out among the most productive, with 44,7 sacs/ha.

The second group was formed by three progenies IBC-Palma 1, Catucaí Vermelho 24/137 and Sabiá Tardio, with 42,7, 41,4 and 41,1 sacs/ha, respectively. Matiello et al. (2007), In a study of progenies with resistance to rust in southern Minas Gerais, after five crops, found that Sabiá Tardio and Catucaí Vermelho 24/137 stood out among the most productive, with a productivity of 39.6 and 31.8 sacs / ha, respectively. Later, in another study conducted in southern Minas Gerais, to cultivate Sabiá Tardio again stood out as the most productive for six crops, with an average yield of 40,89 sacs/ha (PAIVA et al., 2010).

The third group was included which the largest number of genotypes, being made up of seven progenies and two cultivars, with the amplitude which was 33,7 sacs/ha (Catucaí Vermelho 36/6) a 39,4 sacas/ha (Catucaí Amarelo 20/15), leaving the fourth group composed only by progeny IBC-Palma 2. All progenies, except IBC-Palma 2, had productivity equal to or superior to the cultivar Catuaí Amarelo IAC 66/69 (control), with 38,4 sacs/ha.

Only two groups were formed for the percentage of fruit cherries. The first group, consisting of 11 progenies and cultivars, the percent fruit cherries ranged from 48.4% to 75.3%.

The cultivar Obatã Vermelho IAC 1669-20 provided 75.3% of fruit cherries. In the bottom position was only progeny Catucaí Vermelho 20/15, with 21.5% of its fruit at the cherry. This low percentage of cherry fruit due to the fact that most of the fruits was already in stages passed (51,8%) and dry (22,0%), corroborating information that Catucaí Vermelho 20/15 hp 476 has early maturing (CARVALHO, C. et al., 2008).

The analysis of the percentage of green fruit also resulted in the separation of the progeny into two groups: the first consisting of five progenies and cultivars, the percentage of green fruit ranged from 10.9% in cultivar Obatã Vermelho IAC 1669-20 at 19,9% in the progeny IBC-Palma 2. The second group was made up of seven progenies and ranged from 1.9% in the progeny Catucaí Vermelho 36/6 at 8,5%, in progeny Catucaí Vermelho 24/137.

The percentage of fruits passed, intermediate stage between cherry and dry, ranged from 51.8% to 8.6%. The group with the highest percentage of fruit passed was formed by two progenies, Catucaí Vermelho 20/15 with 51,8% and Catucaí Amarelo 20/15 with 41,3% of fruits passed. The second group consisted of 10 progenies and cultivars, ranging from 27.7% in the progeny Catucaí Amarelo 2 SL at 8,6%, in progeny Arara planta 418 (3-25). The highest average percentage of dry fruits were presented by the progeny Catucaí Vermelho 20/15, with 22,0%.

TABLE 3 - Average agronomic traits of progenies and cultivars evaluated coffees at the Experimental Farm - MAP / Foundation Procafé in Varginha, MG.

Trea.	Progenies and Cultivars	Prod.	Cherry	Green	Passed	Dry
01	Obatã Vermelho IAC 1669-20	35,0 c	75,3 a	10,9 a	11,0 b	2,7 b
02	Catucaí Vermelho 36/6 planta 365	33,7 c	74,9 a	1,9 b	19,1 b	4,1 b
03	Catucaí Amarelo 24/137 planta 388	38,2 c	74,4 a	11,4 a	10,7 b	3,4 b
04	Arara planta 418	50,2 a	74,1 a	16,9 a	8,60 b	0,3 b
05	Acauã planta 363 planta 375	34,4 c	69,2 a	14,1 a	15,1 b	1,7 b
06	Catucaí Vermelho 24/137 planta 235	41,4 b	67,4 a	8,5 b	20,0 b	4,0 b
07	Catucaí Amarelo 2 SL planta 479 planta 335 planta 755	36,4 c	65,3 a	3,2 b	27,7 b	3,9 b
08	Catuaí Amarelo IAC 66/69 *	38,4 c	65,2 a	11,5 a	17,5 b	5,7 b
09	Sabiá Tardio planta 398 planta 649	41,1 b	65,1 a	6,9 b	21,9 b	6,0 b
10	IBC-Palma 1 planta 324	42,7 b	62,0 a	15,6 a	13,1 b	9,2 b
11	IBC-Palma 2 planta 181	21,7 d	61,6 a	19,9 a	12,8 b	5,7 b
12	Saíra planta 557	38,7 c	60,9 a	6,5 b	25,7 b	6,8 b
13	Catucaí Amarelo 20/15 planta 479 planta 527	39,4 c	48,4 a	3,1 b	41,3 a	7,2 b
14	Catucaí Vermelho 20/15 planta 476 planta 626	35,6 c	21,5 b	4,7 b	51,8 a	22,0 a
Trea.	Progenies and Cultivars	Empty Locule	Flat	Moca	16 and above	10 moca
01	Obatã Vermelho IAC 1669-20	2,7 c	82,5 a	15,9 c	69,5 a	11,3 d
02	Catucaí Vermelho 36/6 planta 365	3,5 b	72,5 b	24,5 b	44,9 c	22,2 c
03	Catucaí Amarelo 24/137 planta 388	3,0 c	77,3 a	22,3 b	55,6 b	17,9 c
04	Arara planta 418	2,8 c	85,9 a	12,3 c	54,0 b	11,9 d
05	Acauã planta 363 planta 375	4,1 b	52,6 c	45,4 a	32,4 d	40,9 a
06	Catucaí Vermelho 24/137 planta 235	3,0 c	77,4 a	21,2 b	29,7 d	19,3 c
07	Catucaí Amarelo 2 SL planta 479 planta 335 planta 755	4,6 b	80,5 a	19,2 c	56,8 b	15,5 d
08	Catuaí Amarelo IAC 66/69 *	3,7 b	79,8 a	18,4 c	58,5 b	18,3 c
09	Sabiá Tardio planta 398 planta 649	3,8 b	82,1 a	17,2 c	38,5 c	13,8 d
10	IBC-Palma 1 planta 324	4,0 b	80,5 a	18,1 c	58,2 b	16,0 d
11	IBC-Palma 2 planta 181	3,2 c	69,6 b	29,6 b	53,9 b	26,8 b
12	Saíra planta 557	3,9 b	82,2 a	16,3 c	53,1 b	14,3 d
13	Catucaí Amarelo 20/15 planta 479 planta 527	3,1 c	77,1 a	21,9 b	31,9 d	14,6 d
14	Catucaí Vermelho 20/15 planta 476 planta 626	6,5 a	81,1 a	17,3 c	34,8 d	12,4 d

* Cultivar used as control; Averages followed by same letter in same column belong to a comum group, by the Scott-Knott test, at 1% probability.

The percentage of empty locule fruits was formed of three groups: the progeny Catucaí Vermelho 20/15 was the one that presented higher percentage of empty locule beans, with 6,5%. The second group was formed by six progenies and one cultivar, varying between 4,6% and 3,5%, in the progenies Catucaí Amarelo 2 SL and Catucaí Vermelho 36/6, respectively. And the third group, was formed by six genotypes, varying between themselves from 3,2% to 2,7% of empty locule. According to Carvalho et al. (2006), above 90% of well grained fruits is a percentage considered satisfying by the enhancers, during asessment and selection of coffee trees in enhancement programes, since a large sum of the cultivars present such percentage.

The flat beans percentage varied from 85,9% to 52,6%, forming three groups. The first was formed by 9 progenies and two cultivars and varied from 85,9% for progeny Arara, planta 418 to 77,1% in progeny Catucaí Amarelo 20/15. The second group was formed by two progenies, Catucaí Vermelho 36/6, with 72,5% and IBC-Palma 2, with 69,6%. In the las position was progeny Acauã, with 52,6%.

It was noted the formation of three groups for the percentage of grain mocha type: the first was formed by the progeny Acauã, with 45.4% of grain type mocha. According to Carvalho, C. et al. (2008), to cultivate Acauã have good productivity, however, presented a high percentage of grains like mocha, as can be demonstrated in this work. In the second group, the percentage of mocha ranged from 21.2% for the progeny Catucaí Red 24/137 for a 29.6% progeny Palma IBC-2, and the third group, consisting of six progenies and cultivars ranged from 12.3% to Arara plant from 418 to 19.2% for Catucaí Yellow 2 SL.

The cultivar Red Obatã IAC 1669-20 had the highest average, with 69.5% of high grain sieve. Comparing with the work performed by Carvalho, C. et al. (2008), Dias et al. (2005) and Palva et al. (2010), one can consider to cultivate Obatã Red IAC 1669-20 as a producer of grain sieve high regardless of where this cultivar is evaluated.

The percentage of grains retained on sieve 10 mocha hit amplitude ranged from 11.3% in cultivar Red Obatã IAC 1669-20 to 40.9% in the progeny Acauã, forming four groups. For this feature, we can highlight the cultivar IAC Obatã Red 1669-20, and 418 plant progenies Macaw, Yellow Catucaí 2 SL, Sabia Tardio, IBC-1 Palma, Saíra, Catucaí Yellow 20/15 and Catucaí Red 20/15 which showed average higher than the control (Catuaí Amarelo IAC 66/69).

The screen classification is shown to be a characteristic related to the quality standards of the product, to serve as a criterion in the selection of genotypes of a new cultivar. Thus, as proposed in this work, the progenies that have a better screen classification should be considered for jobs coffee breeding (PAIVA et al., 2010; PEDRO et al., 2011).

Table 4 presents the correlation coefficients between agronomic traits. Correlations are observed both positive and negative. Freitas et al. (2007) studied the correlation coefficients between vegetative characters of coffee in training, also found correlations between positive and negative traits. This is due to pleiotropy or linkage disequilibrium between the genes responsible for these traits. Some genes may increase the value of two phenotypic characteristics while others increase and decrease of the other one, causing a positive correlation and / or negative, respectively (FALCONER, 1987).

The correlation between the percentage of fruits with cherries fruits raisins (rf = -0.762), and also the percentage of nuts (rf = -0.893) is presented as normal factor, whereas no progeny have coffee with full uniformity of maturation. Adão (2002), working with 42 coffee progenies found phenotypic correlation between these same characteristics: (rf = -1.000) and (rf = -0.979), respectively, as was to be expected.

Considering the mean grain yield as the main feature in the study and having seen that it does not correlate well with any of the other traits, you can not apply indirect selection because the evaluated characteristics are not strongly associated.

To study the genetic divergence was estimated distances between progenies by the method of generalized Mahalanobis distances, using all the characteristics studied. These distances are shown in Table 5. For these results, one can observe that the longest distance (104.24) was found among the progeny Acauã and Catucaí Red 20/15 and the shortest distance (2.98) between the progeny Catucaí Yellow 24/137 and Catuaí Yellow IAC 66/69. Genetically, it is considered that the progenies Acauã Catucaí Red and 20/15 are the most divergent and progeny Catucaí Yellow 24/137, with the Yellow Catuaí IAC 66/69 the most similar.

TABLE 4 - Phenotypical correlation coefficients (r_f) between the agricultural characteristics of progenies and cultivars of coffee.

Characters	Prod.	Cherry	Green	Passed	Dry	Empty locule	Flat	Moca	Shell	16 and above	10 moca
Prod.	1	0,029	-0,234	-0,067	-0,128	-0,077	0,544	-0,467	0,098	-0,055	-0,484
Cherry		1	0,183	-0,762	-0,893	-0,371	-0,497	0,127	0,015	0,314	0,316
Green			1	-0,376	-0,129	-0,259	-0,458	0,102	-0,150	0,308	0,340
Passed				1	0,892	0,462	0,527	0,042	0,076	-0,493	-0,268
Dry					1	0,452	0,455	-0,073	0,115	-0,312	-0,275
Empty locule						1	0,013	0,353	0,136	-0,380	0,276
Flat							1	-0,706	-0,138	-0,048	-0,877
Moca								1	0,104	-0,558	0,918
Shell									1	-0,192	0,179
16 and above										1	-0,329
10 moca											1

TABLE 5 - Distances between progenies and coffee cultivars calculated on generalized Mahalanobis distances.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	0	34,5	11,6	14,7	101,5	35,1	21,2	13,3	24,9	8,6	38,6	15,6	55,9	74,2
2		0	16,7	34,6	39,6	8,8	19,9	15,7	13,7	25,7	40,1	13,9	18,5	43,8
3			0	14,5	55,1	14,4	5,7	2,9	9,2	5,7	24,6	7,7	29,8	53,7
4				0	101,8	26,4	22,4	12,1	17,7	10,1	64,3	14,6	42,3	71,1
5					0	46,2	67,3	59,7	67,3	73,3	41,8	72,3	72,9	104,2
6						0	18,9	16,8	5,0	21,2	42,2	15,5	16,1	39,7
7							0	5,8	8,5	13,4	39,3	8,8	24,1	43,8
8								0	10,8	4,9	30,4	6,6	31,0	48,6
9									0	14,1	46,1	6,5	12,4	30,9
10										0	34,5	9,1	43,6	52,4
11											0	42,2	71,5	83,6
12												0	18,2	33,5
13													0	25,9
14														0

The progeny Acauã is from the cross between Mundo Novo IAC 388-17 'and Sarchimor IAC 1668, and progeny Catucaí Red 20/15 is from the cross between' Icatu 'and' Catuai '. Because they are from different parents, this may explain the discrepancy between the materials (CARVALHO, C. et al., 2008).

The progenies Arara, plant 418 and Catucaí Amarelo 20/15 may be indicated for future crosses, considering that these genetic materials showed some genetic divergence. Besides the progeny Arara, plant 418 have emerged as the most productive and Catucaí Amarelo 20/15 have provided reasonable production. Thus, it appears that the information obtained in this study can support breeding programs for specific purposes, to enable the appropriate choice of parents.

4 CONCLUSIONS

Progenies and cultivars show variation when the agronomic characteristics are evaluated in isolation.

It is not reasonable to apply to indirect selection on traits evaluated as the average yield of grain is not strongly associated with other characteristics.

The progenies Arara, plant 418 and Catucaí Amarelo 20/15 are indicated for future crosses, considering that these genetic materials are more productive than the witness Catuai Amarelo IAC 66/69 and exhibit genetic divergence.

This information may help breeding programs for specific purposes, to enable the appropriate choice of parents.

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