

## IAC-Galante and IAC-Centauro: special common bean types

Sérgio Augusto Morais Carbonell<sup>1\*</sup>, Alisson Fernando Chiorato<sup>1</sup>, Cássia Regina Limonta Carvalho<sup>1</sup>, Luciana Lasry Benchimol<sup>1</sup>, Ana Luiza Ahern Beraldo<sup>1</sup>, João Guilherme Ribeiro Gonçalves<sup>1</sup>, Marcelo Ticelli<sup>2</sup>, Paulo Sérgio de Souza<sup>3</sup>, and Paulo Boller Gallo<sup>3</sup>

Received 01 February 2008

Accepted 30 March 2008

**ABSTRACT** - Common bean types with pinkish and light brown teguments were predominant in Brazil before 1970, until the release of the Carioca common bean. To avoid that these common bean types sink into oblivion, the Instituto Agronômico Campinas applied for the registration of two cultivars by the MAPA/RNC: IAC-Galante (pinkish) and IAC-Centauro (light brown), with high yield and resistance to anthracnose and common mosaic.

**Key words:** *Phaseolus vulgaris* L., common bean, yield, genetic improvement.

### INTRODUCTION

Common bean is consumed by all social classes in Brazil. For the population of lower purchasing power, particularly, common bean is the main protein, mineral and vitamin source. The nutritive importance, given by the lower cost of bean than animal protein, reinforces the need of a high technological bean grain quality.

The cultivars IAC-Galante and IAC-Centauro were developed by the Instituto Agronômico Campinas (IAC) to revive the consumption by the Brazilian population of grain types other than the carioca and black beans. Before the 70ies, the consumption of these bean types was considerable. Besides the high yield and anthracnose resistance (to the physiological races 31, 65 and 89) of IAC-Centauro, the culinary bean quality is maintained in the cooking process, with a thick broth and light brown color. Cultivar IAC-Galante also

preserves maintaining the culinary quality of the pinkish bean type in the cooking process, besides a high yield and anthracnose resistance (to the physiological races 31, 65 and 89). These diseases were responsible for the disappearance of cultivars with pinkish grain, since they impede the production of satisfactory quality seeds.

### GENETIC ORIGIN AND DEVELOPMENT

Cultivar IAC-Galante was derived from a cross performed at the IAC, in Campinas, state of São Paulo, in 1996, between the genotypes {(IAC Carioca Aruã . G5686) x [(Xan251 . IAC Carioca Akytã) . (IAC Carioca Pyatã . Mar 1)]} x L317-1. This cross was designated Gen 96A100 and line Gen 96A100-6-1-53-1 with pinkish grain was identified in plant selections until the winter harvest of 2000.

<sup>1</sup> Instituto Agronômico (IAC), Centro de Análises e Pesquisa Tecnológica do Agronegócio dos Grãos e Fibras, C.P. 28, 13.001-970, Campinas, SP, Brasil. \*E-mail: carbonel@iac.sp.gov.br

<sup>2</sup> Pólo Regional de Desenvolvimento Tecnológico do Agronegócio - APTA Alta Mogiana, Av. Rui Barbosa s/nº, 14.770-000, Colina, SP, Brasil

<sup>3</sup> Pólo Regional de Desenvolvimento Tecnológico do Agronegócio - APTA Nordeste Paulista, Avenida Presidente Castelo Branco, s/nº, C.P. 58, 13.730-972, Mococa, SP, Brasil



Cultivar IAC-Centauro was derived from a cross performed at the IAC, in 1996, between the genotypes {(IAC Carioca Aruã . G5686) x [(Xan251 . IAC Carioca Akytã) . (IAC Carioca Pyatã . Mar 1)]} x IAC-Carioca Aruã. This cross was demonimated Gen 96A101 and plant selections until the winter harvest of 2000, identified line Gen 96A101-1-2-51-1 with light brown grain type.

In preliminary trials beginning in the dry season of 2001, good yield and anthracnose resistance were observed in these lines. In the wet season of 2005, the lines were included in the trials of Value for Cultivation and Use (VCU) 2005/2006/2007 of special grains in São Paulo. In view of the plant traits, grain color, disease resistance to anthracnose and common mosaic, yield and stability of production line Gen 96A101-1-2-51-1 was designated IAC-Centauro and line Gen 96A100-6-1-53-1 named IAC-Galante. Genetic seed production began in 2007.

## GRAIN YIELD CAPACITY

The yield potential of the cultivars IAC-Galante (4,735 kg.ha<sup>-1</sup>) and IAC-Centauro (4,352 kg/ha), observed in an environment of the 24 VCU trials with 15 genotypes, demonstrated the yield potential of these cultivars in favorable environments. The mean yield of IAC-Galante in these trials was 2,260, 2,210 and 2,160 kg ha<sup>-1</sup> in the rainy, dry and winter seasons, respectively, and 2,482, 2,163 and 2,708 kg ha<sup>-1</sup>, for IAC-Centauro, respectively. The mean yield of control Rosinha G2 was 2,157, 2,248 and 2,208 kg ha<sup>-1</sup> in these

harvests (Table 1).

The MSD (minimal significant difference – 5%) in the mean yield of these two cultivars was significant for the rainy season, compared to Rosinha G<sub>2</sub>. The mean yield of IAC-Centauro was also higher than Rosinha G<sub>2</sub> in the winter season. No differences were observed between these two cultivars and the control Rosinha G<sub>2</sub> in the other seasons and in the joint analysis of growing seasons.

## OTHER TRAITS

Cultivar IAC-Galante has an upright growth (type II), is resistant to anthracnose and common mosaic and 1,000 seeds weigh 250 grams. The cycle from emergence to physiological maturation lasts 92 days, with medium guides, regular white flowers and yellow/straw-colored pods.

IAC-Centauro has an upright growth (type II), anthracnose resistance and a weight of 1,000 seeds of 235 grams. The cycle from emergence to physiological maturation lasts 92 days, the guides are long, the flowers uniform and white and the pods yellow/straw-colored.

The mean cooking time (minutes) for the IAC-Galante was slightly shorter (26.83) than of cultivar Rosinha G<sub>2</sub> (27.74). The cooking time of IAC-Centauro was longer (30.42), and the broth quality of both was excellent, with whole grains in the end of cooking. The protein content varied according to the environment and was 20.13 and 21.30% in the mean in the grains of IAC-Galante and IAC-Centauro, respectively (Table 2).

**Table 1.** Yield (kg ha<sup>-1</sup>), coefficient of experimental variation (CV%) and minimum significant difference (Dunnett-5%) compared to the control mean (C), per growing season and joint growing seasons, in the VCU trials of common bean for the state of São Paulo, in 2005/2006/2007

Common bean cultivars	Growing season			Mean 2005/2006/2007 (kg ha <sup>-1</sup> )
	Rainy (9 environments)	Dry (8 environments)	Winter (7 environments)	
Rosinha G <sub>2</sub> (C)	2157	2248	2208	2202
IAC-Centauro	2482	2163	2708	2354
IAC-Galante	2660	2210	2160	2364
Mean <sup>1</sup> (kg ha <sup>-1</sup> )	2268	2142	2372	2256
C.V. (%)	16.69	16.55	16.62	16.64
MSD (kg ha <sup>-1</sup> )	290	288	343	175

<sup>1</sup>Experimental mean with 15 cultivars and lines, with a coefficient of variation below 25%

\* Dunnett test (5%) compared to the standard cultivar (Rosinha G<sub>2</sub>)



Table 2. Technical/nutritional quality: mean cooking time in minutes in a Mattison cooker and protein content (%) in common bean grains in VCU trials in the state of São Paulo, in 2005/2006/2007

Season	Location	IAC-Galante		IAC-Centauro		Rosinha G2	
		Cooking time (min)	Protein content (%)	Cooking time (min)	Protein content (%)	Cooking time (min)	Protein content (%)
Rainy/2005	Mococa	28.88	17.63	29.09	17.67	29.22	16.61
Rainy/2005	Capão Bonito	27.35	20.43	29.58	22.58	29.99	21.57
Rainy/2005	Monte Alegre do Sul	27.24	15.81	27.14	17.44	26.49	17.41
Dry/2006	Mococa	26.38	16.61	33.27	19.54	25.59	18.14
Dry/2006	Avaré	26.32	19.91	21.05	20.35	26.37	20.33
Dry/2006	Capão Bonito	19.34	22.87	45.83	24.62	36.27	18.72
Winter/2006	Colina	22.40	18.77	37.07	17.64	25.65	18.55
Winter/2006	Ribeirão Preto	25.22	23.48	26.80	24.39	14.62	23.24
Winter/2006	Fernandópolis	22.99	20.66	38.54	20.95	28.60	20.39
Rainy/2006	Tatui	20.91	19.61	20.32	20.70	30.79	19.17
Rainy/2006	Mococa	28.29	16.16	19.70	19.40	19.43	18.48
Rainy/2006	Capão Bonito	18.24	19.15	20.81	20.72	16.10	21.20
Dry/2007	Avaré	26.32	21.31	25.91	21.53	21.69	20.67
Dry/2007	Tatui	33.83	21.26	27.37	18.48	24.01	17.95
Dry/2007	Monte Alegre do Sul	27.84	22.45	33.32	22.85	37.92	22.85
Winter/2007	Colina	35.99	22.00	44.33	25.02	31.50	22.21
Winter/2007	Araras	35.66	22.46	37.09	23.86	42.28	22.57
Winter/2007	Mococa	29.76	21.84	30.34	25.64	32.71	20.95
<b>Mean rainy season</b>		<b>25.15</b>	<b>18.13</b>	<b>24.44</b>	<b>19.75</b>	<b>25.34</b>	<b>19.07</b>
<b>Mean winter season</b>		<b>28.67</b>	<b>21.54</b>	<b>35.70</b>	<b>22.92</b>	<b>29.23</b>	<b>21.32</b>
<b>Mean dry season</b>		<b>26.67</b>	<b>20.74</b>	<b>31.13</b>	<b>21.23</b>	<b>28.64</b>	<b>19.78</b>
<b>Overall mean</b>		<b>26.83</b>	<b>20.13</b>	<b>30.42</b>	<b>21.30</b>	<b>27.74</b>	<b>20.06</b>

**RECOMMENDATION TECHNIQUE AND SEED PRODUCTION**

The cultivars IAC-Galante and IAC-Centauro are recommended for sowing, according to the ecological zoning of the state of São Paulo, for the three growing seasons. A between—row spacing of 50 cm and of 12 plants per meter linear is recommended, totaling 240,000 plants per hectare. The IAC is in charge of the seed production of these cultivars. On 28/12/2007 IAC-Galante was registered by the MAPA/RNC (number 22630) and IAC-Centauro was indexed on 04/01/2008 (RNC 22666). The application of protection of these cultivars is being examined by the MAPA/SNPC.

**GRAIN YIELD CAPACITY**

The yield potential of the cultivars IAC-Galante (14,745 kg ha<sup>-1</sup>) and IAC-Centauro (12,105 kg ha<sup>-1</sup>) observed in an experiment of the 24 VCU trials with 15 genotypes, demonstrated the yield potential of these cultivars in favorable environments. The mean yield of IAC-Galante (2,457, 2,167 and 2,105 kg ha<sup>-1</sup>) and IAC-Centauro (2,457, 2,167 and 2,105 kg ha<sup>-1</sup>) respectively, and 2,457, 2,167 and 2,105 kg ha<sup>-1</sup> for IAC-Centauro, respectively. The mean yield of control Rosinha (2 was 2,131, 2,246 and 2,246 kg ha<sup>-1</sup> in these

Table 1. Yield (kg ha<sup>-1</sup>) of control and experimental cultivars in 2007, 2008 and 2009.

Cultivar	2007	2008	2009
Control Rosinha (2)	2131	2246	2246
IAC-Centauro	2457	2167	2105
IAC-Galante	2457	2167	2105
Mean (kg ha <sup>-1</sup> )	2457	2167	2105
MSD (kg ha <sup>-1</sup> )	100	100	100
Experimental error	100	100	100