

## INT7100 IPRO - A soybean cultivar for an extensive growing area in the South and Cerrado in Brazil

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**Abstract:** Soybean cultivars with “plasticity” traits, such as good branching ability, ensure compensation of gaps in planting. The cultivar INT7100 IPRO provides excellent branching ability and plant architecture, facilitating control of pests and diseases, and it contains the biotechnology INTACTA RR2 PRO®. It is resistant to stem canker, brown stem rot, and bacterial blight.

**Keywords:** *Glycine max*, branching, early maturity, disease resistance, glyphosate tolerance.

### INTRODUCTION

Soybean (*Glycine max* L. Merrill) growing is one of the agricultural activities that has most increased worldwide in recent decades. Brazil has had a prominent position in this expansion, and the area planted to soybean represents approximately 57% of the area dedicated to grain cultivation in the country. In the 2017/2018 crop season, Brazil produced 119 million tons of soybean, with an average yield of 3394 kg ha<sup>-1</sup> (CONAB 2019).

Currently, in choosing a soybean cultivar, producers observe not only yield, but also the following factors: recommended growing region, maturity group, growth type, average crop cycle, plant height, resistance to lodging, sowing season, and reaction to diseases (Sedyama et al. 2015). Other important characteristics are protection against the main leaf-eating caterpillars and tolerance to glyphosate herbicide, which is currently conferred through insertion of the INTACTA RR2 PRO® biotechnology (Uarrota et al. 2019).

The development of early-maturity soybean cultivars is the main objective of the soybean breeding program developed by the Centro Universitário Integrado de Campo Mourão, PR, Brazil, to allow the producer to take advantage of a second crop season. The cultivar developed must not only have early maturity, but also good yield potential, which is a characteristic of the cultivar INT7100 IPRO, since its excellent branching allows it to maintain the number of pods and grains per square meter even with gaps in planting.


### METHODS

The soybean cultivar INT7100 IPRO was derived from crossbreeding the

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elite inbred lines INT19372 and INT19360 in the Genetic Improvement Program of the Centro Universitário Integrado (CEI) in Campo Mourão, Paraná, Brazil. After obtaining the F<sub>1</sub> seeds, the segregating generations proceeded by the SPD (Single Pod Descent) method. The cross that generated the cultivar registered as INT7100 IPRO was called 14/MO60.23 until the end of selection and harvest of the progenies at the experimental station in the 2013/2014 crop season. In the 2014/2015 crop season, it was placed for evaluation in a preliminary test. In the 2015/2016 and 2016/2017 crop seasons, value for cultivation and use (VCU) experiments were performed, following the requirements of the Brazilian Ministry of Agriculture (MAPA), in diverse soil and climatic conditions in soybean macro-regions 1, 2, and 3, in order to expand recommendation of the cultivar for wider and more diverse environments. Genetic seed production started in 2017.

## PERFORMANCE CHARACTERISTICS

Experiments were conducted in the 2015/2016, 2016/2017, and 2017/2018 crop seasons, for a total of 21 environments in the states of Paraná, Goiás, and Mato Grosso do Sul, which were evaluated according to MAPA criteria (Table 1). These environments represent different edaphic and climatic regions and soybean macro-regions. Thus, for each location, a planting density was used that, together with good management, allows the cultivar under testing to obtain good yield from its architectural, branching, and early maturity characteristics (Table 2). After analysis of the data and confirmation of superior performance of INT7100 IPRO compared to the commercial controls recommended for each location, the cultivar was registered for growing.

In the yield evaluations, the cultivar INT7100 IPRO obtained a higher average than all the commercial cultivars used as controls, considering the overall average of the three crop seasons (2015/2016, 2016/2017, and 2017/2018) evaluated in each location (Table 2). The superiority of its performance compared to the controls used in each environment ranged from 3% to 32% in relative grain yield. Commercial cultivars with prominent yields for each site were used as checks.

Considering the edaphic and climatic regions (ECRs) used, the mean yield of the cultivar INT7100 IPRO was 4297 kg ha<sup>-1</sup> for ECR 103, 13% higher than the check M6210 IPRO (3810 kg ha<sup>-1</sup>) and 7% higher than DM 6563RSF IPRO (4033 kg ha<sup>-1</sup>). For ECR 201, its mean yield was 4441 kg ha<sup>-1</sup>, 16% higher than DM 6563RSF IPRO (3831 kg ha<sup>-1</sup>) and 3% higher than M6210 IPRO (4313 kg ha<sup>-1</sup>). In ECR 202, its mean yield was 3599 kg ha<sup>-1</sup>, corresponding to a 10% increase in relative yield compared to BMX POTÊNCIA RR (3281 kg ha<sup>-1</sup>) and 1% higher than M6410 IPRO (3561 kg ha<sup>-1</sup>). Finally, in ECR 301, the cultivar INT7100 IPRO had a mean yield of 3781 kg ha<sup>-1</sup>, 11% higher than BMX DESAFIO 8473 RSF RR (3403 kg ha<sup>-1</sup>) and 9% higher than BMX POTÊNCIA RR (3473 kg ha<sup>-1</sup>).

Adaptability and stability assessments were also made with the yield data from the regions tested. The results indicated that the cultivar INT7100 IPRO was not only higher yielding than the highest yielding cultivars on the market, but also had wide adaptability and stability.

The most appropriate season for sowing is from September 20 to October 30 for locations in the South region and from October 1 to November 5 for locations in Goiás and Mato Grosso. The cultivar requires medium to high fertility soils for all indicated regions. It is classified as early maturity and falls within maturation group 6.4, with a cycle from 118 to 125 days.

**Table 1.** Municipalities of the experimental trials (LOCATION), state (STATE), soybean macro-region (MR), edaphic and climatic region (ECR), and ideal sowing density (DENSITY) for cultivating INT7100 IPRO

Location	State	MR	ECR	DENSITY
Guarapuava	PR	1	103	12
Campo Mourão	PR	2	201	14
Floresta	PR	2	201	16
Luiziana	PR	2	201	12
Maracajú	PR	2	202	16
Rio Verde	GO	3	301	18
Cristalina	GO	3	301	14

**Table 2.** Mean yield (MY) and relative yield (RY) of cultivar INT7100 IPRO compared to commercial controls in the 2015/2016, 2016/2017, and 2017/2018 crop seasons in the state of Paraná, Goiás, and Mato Grosso do Sul

Location	Cultivar	15/16	16/17	17/18	MY (kg ha <sup>-1</sup> )	RY (%)
Guarapuava/PR	M6210IPRO	3078	4784	3568	3810	100
	DM 6563RSF IPRO	3344	5175	3580	4033	106
	INT7100 IPRO	3629	4837	4425	4297	113
Campo Mourão/PR	M6210IPRO	3662	4034	4744	4147	125
	DM 6563RSF IPRO	2622	2290	5052	3321	100
	INT7100 IPRO	3697	3911	5522	4377	132
Floresta/PR	M6210IPRO	2623	5288	4152	4021	106
	DM 6563RSF IPRO	2467	5101	3827	3798	100
	INT7100 IPRO	3490	5107	3785	4127	109
Luiziana/PR	M6210IPRO	4222	5366	4726	4805	109
	DM 6563RSF IPRO	4155	4953	4014	4374	100
	INT7100 IPRO	4653	5225	4575	4818	110
Maracaju/MS	BMX POTÊNCIA RR	3825	4637	5192	4551	100
	M6410IPRO	4770	4724	5556	5017	110
	INT7100 IPRO	5053	5121	5468	5214	115
Rio Verde/GO	BMX POTÊNCIA RR	3187	3661	4016	3621	103
	BMX DESAFIO 8473 RSF RR	2779	4125	3682	3529	100
	INT7100 IPRO	3411	4457	4087	3985	113
Cristalina/GO	BMX POTÊNCIA RR	1637	4142	4195	3325	101
	BMX DESAFIO 8473 RSF RR	1733	4218	3881	3277	100
	INT7100 IPRO	2220	4333	4175	3576	109

The INT7100 IPRO soybean cultivar has indeterminate growth habit, excellent yield, yellow seeds of low luster, light brown hilum, purple flowers, and dehiscence resistant pods with gray pubescence and that are light gray, and the 100 seed weight is approximately 16 g. It is resistant to lodging and reaches a height of around 80 to 115 cm in the South and 70 to 95 cm in the regions of Mato Grosso do Sul and Goiás.

It is resistant to reniform nematode (*Rotylenchulus reniformis*), moderately resistant to root-knot nematode (*Meloidogyne incognita*), and susceptible to *Meloidogyne javanica* species and to soybean cyst nematode (*Heterodora glycines*). It is resistant to stem canker (*Diaporthe phaseolorum* sp. *meridionalis*), brown stem rot (*Cadophora gregata*), and bacterial blight (*Pseudomonas syringae* pv *glycinea*). It is moderately resistant to frog-eye leaf spot (*Cercospora sojina*), powdery mildew (*Microsphaera diffusa*), phytophthora root rot (*Phytophthora sojae*), and target leaf spot (*Corynespora cassiicola*) and susceptible to bacterial pustule (*Xanthomonas axonopodis* pv. *glycines*).

## FOUNDATION SEED PRODUCTION

The cultivar INT7100 IPRO was registered in the Brazilian Ministry of Agriculture (Ministério da Agricultura, Pecuária e Abastecimento - MAPA) on October 23, 2017 under number 37292. The seeds of the cultivar INT7100 IPRO are produced by Agropecuária Ipê, Tec Agro, Unigell Sementes, and Sementes Goiás.

**Table 3.** Mean yield (MY) and relative yield (RY) of cultivar INT7100 IPRO compared to commercial controls in the 2015/2016, 2016/2017, and 2017/2018 crop seasons in the 4 edaphic and climatic regions (ECR)

ECR <sup>1</sup>	Cultivar	MY (kg ha <sup>-1</sup> )	RY (%)
103	M6210IPRO	3810	100
	DM 6563RSF IPRO	4033	106
	INT7100 IPRO	4297	113
103	M6210IPRO	4313	113
	DM 6563RSF IPRO	3831	100
	INT7100 IPRO	4441	116
202	BMX POTÊNCIA RR	3281	100
	BMX DESAFIO 8473 RSF RR	3561	109
	INT7100 IPRO	3599	110
301	BMX POTÊNCIA RR	3473	102
	BMX DESAFIO 8473 RSF RR	3403	100
	INT7100 IPRO	3781	111

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