

## BRSMG Camaleão: new mungbean cultivar with large, shiny, green seeds

Rogério Faria Vieira<sup>1\*</sup>, José Eustáquio de Souza Carneiro<sup>2</sup>, Trazilbo José de Paula Júnior<sup>3</sup>, Renan Cardoso Lima<sup>4</sup>, Bruno de Almeida Soares<sup>2</sup>, Pablo Henrique Teixeira<sup>2</sup>, Davy Moreira Santos<sup>2</sup> and Luciano Luís Jacob<sup>3</sup>

**Abstract:** 'BRSMG Camaleão' is a mungbean cultivar with large, shiny, green seeds released for the state of Minas Gerais, Brazil. It was developed by the Asian Vegetable Research and Development Center as line VC 6148-B-16. In seven trials established in the Zona da Mata region, it had an average yield of 1493 kg ha<sup>-1</sup> and 1000-seed weight of 68-78 g.

**Keywords:** *Vigna radiata*, lodging, powdery mildew, cercospora leaf spot

### INTRODUCTION

Mungbean or greengram (*Vigna radiata* (L.) Wilczek) is a warm-season, quick-maturation grain legume or pulse. Mungbean is cultivated on more than six million hectares worldwide, mostly in Asia (Hou et al. 2019). Whole seeds may be sprouted or cooked for consumption. In addition, the split seeds or the split and de-hulled seeds may be boiled, roasted, or ground into flour to make a variety of dishes (GRDC 2014).

More than half of the area cultivated with mungbean worldwide is in India (Kang et al. 2014) and its annual production was 2.16 million t in 2016-2017 (Kumar and Raju 2018), followed by China and Myanmar (Kang et al. 2014). This production does not meet the demand for mungbean in India. Hence, in 2017-2018 India imported approximately 330.000 t of grain, especially from Myanmar (Kumar and Raju 2018).

This demand for mungbean is a major opportunity for Brazilian farmers; opportunities arise to supply the market in India and other markets already served by Australia, such as Japan, the Philippines, the USA, Europe, and the Middle East. In 2016, mungbean production in Australia reached 130.000 t, approximately 95% of which was exported. Based on continued breeding innovations and on expanding market potential, the target for Australian industry is to raise production to 170.000 t soon. The three main classes of mungbean seeds produced in Australia are large, shiny, green; small, shiny, green; and large, dull, green seeds. The largest international market is for large, shiny, green seeds (GRDC 2014).


In Brazil, mungbean is used for preparation of sprouts. For that purpose, our group released three cultivars of this pulse. 'Ouro Verde' was released in 1993; it has small to medium, dull, green seeds (41 to 47 g for 1000-seed weight).

Crop Breeding and Applied Biotechnology  
22(2): e32732227, 2022  
Brazilian Society of Plant Breeding.  
Printed in Brazil  
<http://dx.doi.org/10.1590/1984-70332022v22n2c17>



\*Corresponding author:

E-mail: [rfvieira@epamig.br](mailto:rfvieira@epamig.br)

 ORCID: 0000-0002-5286-8392

Received: 23 November 2020

Accepted: 17 January 2022

Published: 31 May 2022

<sup>1</sup> Embrapa/Epamig, Campus da Universidade Federal de Viçosa, 36.570-900, Viçosa, MG, Brazil

<sup>2</sup> Universidade Federal de Viçosa, Departamento de Agronomia, 36.570-900, Viçosa, MG, Brazil

<sup>3</sup> Epamig, Campus da Universidade Federal de Viçosa, 36.570-900, Viçosa, MG, Brazil

<sup>4</sup> Universidade Federal de Viçosa, Rodovia LMG 818, km 06, s/n, 35.690-000, Florestal, MG, Brazil

In 2000, the lodging-resistant cultivar 'Ouro Verde MG 2' was released (Vieira et al. 2002). It has medium-sized, shiny, green seeds (43 to 51 g for 1000-seed weight) and yielded 12% more than 'Ouro Verde'. 'MGS Esmeralda' was released in 2007 (Vieira et al. 2008); it has medium-sized to large, dull, green seeds (59 to 68 g for 1000 seed weight) and yielded 13% more than 'Ouro Verde MG 2'. Currently, emphasis has shifted to grains for export. Hence, it is necessary to release a mungbean cultivar with large, shiny seeds, which represents the largest international market.

Interest in mungbean for export has increased in Brazil, especially after 2016, when the Indian company United Phosphorus Limited (UPL) formed a partnership with the Brazilian Agricultural Research Corporation (Embrapa) to develop cultivars of pulses (chickpea, pigeonpea, mungbean, and lentil) to be grown in Brazil and exported to India. In response to this demand of India, Brazil exported 36.461 t of mungbean in 2019, most of it produced in the state of Mato Grosso (Comex Stat 2020) using cultivars developed abroad. In the state of Minas Gerais, mungbean production (25 t in 2019) is in the initial phase (Comex Stat 2020), but we believe that the new cultivar may stimulate mungbean production in the regions of Minas Gerais with mechanized agriculture.

This cultivar was registered by the Brazilian Ministry of Agriculture (Ministério da Agricultura, Pecuária e Abastecimento - MAPA). For that reason, BRSMG Camaleão can be planted as a Brazilian cultivar in any state, where it will likely be included in Value for Cultivation and Use (VCU) experiments as a check cultivar.

#### CULTIVAR CHARACTERISTICS

'BRSMG Camaleão' was introduced in Brazil from the Asian Vegetable Research and Development Center (AVRDC), located in Taiwan, as line VC 6148-B-16 in one set of International Mungbean Nursery trials. This line is derived from a cross between lines VC 6370-92 and VC 1560 A made at the AVRDC.

**Table 1.** Lodging, seed yield, and seed weight of 'BRSMG Camaleão' and two previously released cultivars of mungbean (checks) in seven trials conducted in the Zona da Mata region, state of Minas Gerais, Brazil

District (month and year of sowing)	Cultivar	Lodging <sup>1</sup> (1-5)	Yield (kg ha <sup>-1</sup> )	1000-seed weight (g)
Coimbra (Jan. 2001)	BRSMG Camaleão	2.0	2010 abc <sup>2</sup>	6.8
	MGS Esmeralda	1.2	2248 a	6.3
	Ouro Verde MG 2	1.0	1488 d	4.6
Oratórios (July 2002)	BRSMG Camaleão	2.4	951 a	7.8
	MGS Esmeralda	1.7	1100 a	6.1
	Ouro Verde MG 2	1.2	1036 a	5.0
Coimbra (Ago. 2002)	BRSMG Camaleão	-	547 a	7.7
	MGS Esmeralda	-	877 a	6.5
	Ouro Verde MG 2	-	980 a	5.0
Coimbra (Dec. 2002)	BRSMG Camaleão	2.9	1837 a	7.6
	MGS Esmeralda	2.5	1429 a	6.1
	Ouro Verde MG 2	1.9	1343 a	4.3
Coimbra (Feb. 2003)	BRSMG Camaleão	1.5	1862 a	7.6
	MGS Esmeralda	1.7	1683 a	5.9
	Ouro Verde MG 2	1.0	1343 a	4.8
Viçosa (Feb. 2003)	BRSMG Camaleão	2.7	1543 abc	7.8
	MGS Esmeralda	2.4	1758 ab	6.8
	Ouro Verde MG 2	1.7	1863 ab	5.2
Oratórios (Mar. 2003)	BRSMG Camaleão	3.0	1704 a	7.8
	MGS Esmeralda	3.5	1578 a	6.3
	Ouro Verde MG 2	1.9	1519 a	4.7
Average	BRSMG Camaleão	2.4	1493	7.6
	MGS Esmeralda	2.2	1525	6.4
	Ouro Verde MG 2	1.4	1367	4.8

<sup>1</sup> 1 = no lodging, 3 = moderate lodging, and 5 = excessive lodging (Ender et al. 2008).

<sup>2</sup> For each district and month/year of sowing, the letters following each mean yield are letters that these cultivars had in the trials with 10 mungbean lines selected from previous trials.

In the average of seven trials established in the Zona da Mata region of Minas Gerais, 'BRSMG Camaleão' yielded 2% less than 'MGS Esmeralda' and 9% more than 'Ouro Verde MG 2' (Table 1). In addition, in a previous study, 'BRSMG Camaleão' was among the highest yielding genotypes in Viçosa (sown in January) and Oratórios (planted in February), yielding 1601 and 1711 kg ha<sup>-1</sup>, respectively (Vieira et al. 2005). When mungbean, and particularly 'BRSMG Camaleão', is sown during the winter (July or August) in the Zona da Mata region, yields are lower than those obtained from mungbean sown between December and March. The highest yield of 'BRSMG Camaleão' was obtained when it was sown in January in Coimbra: 2010 kg ha<sup>-1</sup>. It is important to mention that this yield was obtained by weekly harvest of the ripening pods. When harvest is performed mechanically after plants have been desiccated, yields are relatively lower.



Figure 1. Seeds of 'BRSMG Camaleão'.

The lodging resistance of 'BRSMG Camaleão' is similar to that of 'MGS Esmeralda', and both have less lodging resistance than 'Ouro Verde MG 2' (Table 1). The main characteristic of 'BRSMG Camaleão' is its large and shiny green seeds (Figure 1), which are preferred by consumers in the international market, especially for sprouting and cooking (GRDC 2014).

Noteworthy characteristics of 'BRSMG Camaleão' include that during the summer, the period between seedling emergence and the first mature pod is approximately 58 days (Table 2), or even faster if temperature is higher (as observed in the state of Mato Grosso). Plant heights vary (32 to 101 cm), depending on conditions for plant growth. This cultivar is characterized by relatively long pods with low pubescence, which facilitate hand harvest. 'BRSMG Camaleão' is moderately resistant to powdery mildew (*Erysiphe polygoni* D.C.) and moderately susceptible to cercospora leaf spot (*Cercospora canescens* Illis & Martin).

Table 2. Plant characteristics of the mungbean cultivar 'BRSMG Camaleão'

Descriptor <sup>1</sup>	Range/characteristic
Days from sowing to emergence	4 to 5
Hypocotyl color (green or greenish purple)	green
Leaf color (light green, green, or dark green)	dark green
Growth habit (upright, semi-upright, or spreading)	semi-upright
Days from seedling emergence to onset of flowering <sup>2</sup>	28 to 33
Days from seedling emergence to first mature pod <sup>2</sup>	58 to 81
Pod pubescence (glabrous, pubescent, moderately pubescent, or densely pubescent)	pubescent
Plant height (cm)	32 to 101
Peduncle length (short = < 14 cm, medium = 14-18 cm, or long = > 18 cm)	medium
Pod length (cm)	9.6 to 11.4
Pod curvature (straight, moderate, or incurved)	moderate
Pod beak shape (hook, knob, or other)	knob
Pod color at maturity (pale yellow, brown, black)	black
Attachment of mature pod to peduncle (pendant, suberect, or erect)	suberect
Seeds per pod	8.8 to 12.7
Reaction to powdery mildew	Moderately resistance
Reaction to cercospora leaf spot	Moderately susceptible
Seed coat color	Bright green
1000-seed weight (g)	68 to 78
Lodging	Moderately susceptible

<sup>1</sup> Based on Bisht et al. (1998).

<sup>2</sup> Under relatively low temperature conditions, flowering and pod maturation are delayed, as shown in the trials established in March, July, and August in Table 1.

'BRSMG Camaleão' is registered in MAPA under no. 36829. Seeds will be available through Epamig ([asagro@epamig.br](mailto:asagro@epamig.br)) beginning in March 2023.

## REFERENCES

- Bisht IS, Mahajan RK and Kawalkar TG (1998) Diversity in greengram (*Vigna radiata* (L.) Wilczek) germplasm collection and its potential use in crop improvement. **Annals of Applied Biology** **132**: 301-312.
- Comex Stat (2020) Exportação e importação geral. Ministério da Indústria Comércio Exterior e Serviços. Available at: <<http://comexstat.mdic.gov.br/pt/geral>> Accessed on May 11, 2020.
- Ender M, Terpstra K and Kelly JD (2008) Marker-assisted selection for white mold resistance in common bean. **Molecular Breeding** **21**: 149-157.
- GRDC - Grains Research & Development Corporation (2014) Mungbeans. Available at: <[grdc-grownotes-mungbeans-northern.pdf](http://grdc-grownotes-mungbeans-northern.pdf)>. Accessed on Jan 26, 2021.
- Hou D, Yousaf L, Xue Y, Hu J, Wu J, Hu X, Feng N and Shen Q (2019) Mung bean (*Vigna radiata* L.): bioactive polyphenols, polysaccharides, peptides, and health benefits. **Nutrients** **11**: 1238.
- Kang YJ, Kim SK, Kim MY, Puji L, Kim KH, Ha B, Jun TH, Hwang WJ, Lee T, Lee J, Shim S, Yoon MY, Jang YE, Han KS, Taeprayoon P, Yoon N, Somta P, Tanya P, Kim KS, Gwag J, Moon J, Lee Y, Park B, Bombarely A, Doyle JJ, Jackson SA, Schafleitner R, Srinives P, Varshney RK and Lee S (2014) Genome sequence of mungbean and insights into evolution within *Vigna* species. **Nature Communications** **5**: 5443.
- Kumar R and Raju KV (2018) Leveraging policies for self sufficiency in pulses in India. **Journal of Development Policy and Practice** **3**: 155-178.
- Vieira RF, Oliveira VR, Vieira C and Pinto CMF (2002) Ouro Verde MG 2: nova cultivar de mungo-verde para Minas Gerais. **Horticultura Brasileira** **20**: 119-120.
- Vieira RF, Pinto CMF and Viana LF (2005) Comportamento de linhagens de mungo-verde no verão-outono na Zona da Mata de Minas Gerais. **Revista Ceres** **52**: 153-164.
- Vieira RF, Carneiro JES, Paula Júnior TJ and Araújo RF (2008) MGS Esmeralda: new large seed mungbean cultivar. **Pesquisa Agropecuária Brasileira** **43**: 781-782.