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RESEARCH ARTICLE

Herbicide selectivity and interference from *Commelina benghalensis* in *Vigna* cultivars

Seletividade de herbicidas e interferência de *Commelina benghalensis* em cultivares de feijões do gênero *Vigna*

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Abstract: **Background**: Vigna bean species have garnered increasing global interest due to their nutritional value and adaptability to unfavorable environmental conditions. Their expansion into Brazil's Cerrado region, however, necessitates reliable herbicide strategies for effective weed suppression under high weed pressure, particularly from *Commelina benghalensis*.
Objective: This study assessed the selectivity of commonly used herbicides and the potential interference of *C. benghalensis* in different *Vigna* cultivars.
Methods: Two greenhouse experiments were conducted in 2022 and 2023 using cultivars of *V. unguiculata* (Itaim, Nova Era, Rouxinol, Tumucumaque), *V. radiata* (Mungo Verde MG2), and *V. angularis* (Azuki). The treatments included S-metolachlor, bentazon + imazamox, quizalofop + fomesafen, clethodim + fomesafen, lactofen + haloxyfop, as well as a weed-free and interference condition with *C. benghalensis*. Herbicide injury, growth variables, and yield parameters were measured.
Results: S-metolachlor markedly reduced seedling emergence in Azuki and Mungo Verde MG2. Although transient injury symptoms were observed in several cultivars, recovery occurred in most cases over time. Significant yield reduction was limited and cultivar-specific. Genetic variability among cultivars influenced herbicide tolerance, indicating the need for selective management strategies. Notably, none of the cultivars exhibited yield reduction due to interference by *C. benghalensis*.
Conclusion: These findings support the potential use of selective herbicide programs for Vigna cultivation, while highlighting the importance of cultivar-dependent tolerance mechanisms.

Resumo: **Introdução**: Espécies do gênero *Vigna* spp. têm recebido crescente interesse em função do valor nutricional e da capacidade de adaptação a condições ambientais adversas. A expansão para áreas comerciais do Cerrado brasileiro exige estratégias adequadas de manejo de plantas daninhas, especialmente em áreas com ocorrência de *Commelina benghalensis*.
Objetivo: Avaliar a seletividade de herbicidas comumente utilizados em soja e feijoeiro comum e a interferência de *C. benghalensis* em cultivares de *Vigna*.
Métodos: Dois experimentos em casa de vegetação foram conduzidos utilizando cultivares de *V. unguiculata* (Itaim, Nova Era, Rouxinol, Tumucumaque), *V. radiata* (Mungo Verde MG2) e *V. angularis* (Azuki). Os tratamentos incluíram S-metolachlor, bentazon + imazamox, quizalofop + fomesafen, clethodim + fomesafen e lactofen + haloxyfop, além de um controle capinado e outro sob interferência de *C. benghalensis*. Foram avaliados sintomas de fitointoxicação, variáveis de crescimento e parâmetros de produtividade.
Resultados: O S-metolachlor reduziu significativamente a emergência de plântulas em Azuki e Mungo Verde MG2. Embora sintomas temporários de injúrias tenham sido observados em várias cultivares, a recuperação ocorreu na maioria dos casos ao longo do ciclo. As reduções de produtividade foram limitadas e dependentes da cultivar. A variabilidade genética influenciou a tolerância aos herbicidas, evidenciando a necessidade de manejo seletivo por cultivar. Não houve impacto significativo da interferência de *C. benghalensis* na produtividade.
Conclusão: Os resultados demonstram o potencial de uso dos herbicidas no feijão Vigna, ressaltando a importância da avaliação de tolerância específica entre cultivares.

Keywords: pulses, S-metolachlor, *Vigna angularis*, *Vigna unguiculata*, *Vigna radiata*.

Palavras-chave: pulses, S-metolachlor, *Vigna angularis*, *Vigna unguiculata*, *Vigna radiata*.

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1. Introduction

Vigna beans are widely valued for their nutritional qualities, notably their richness in proteins, fiber, and essential minerals. Several species within this genus exhibit strong adaptability to challenging environmental conditions, such as drought and high temperatures, as well as notable resilience to pests, diseases, and weed pressure (Dikr, 2023). Consumption of Vigna beans has been associated with diverse health benefits, including reduced risk of cardiovascular diseases, improved immune function, and better glycemic control (Ganesan and Xu, 2018).

As members of the pulses crop group, Vigna beans play an essential role in sustainable agriculture due to their high nutritional value and global consumption. Pulses serve as efficient sources of high-quality protein while requiring relatively less land and water than other protein-producing systems, making them crucial components of resilient and climate-smart food systems aimed at reducing global food insecurity (Adarsh et al., 2019).

The cultivation of Vigna beans is predominantly concentrated in West Africa and Northeast Brazil, with *Vigna unguiculata* (cowpea) being particularly prominent. Brazil, currently the world's third-largest cowpea producer, is projected to reach production levels of approximately 675 thousand tons by 2025 across nearly 1.3 million hectares, with notable expansion occurring in the Central-West and Southeast regions (Conab, 2025).

Driven by growing economic interest and the need for diversification of production systems, Vigna beans have increasingly been integrated into cropping sequences alongside soybean, corn, and common bean (*Phaseolus vulgaris*), especially in second-season or short-season rotations. This intensification requires investments in technology, irrigation, fertilization, mechanized harvesting, and herbicide management (Souza et al., 2024). Many of the management practices adopted for common beans, including the use of herbicides and weed control strategies, are directly extended to Vigna cultivation (Mahajan and Chauhan, 2022).

On many commercial farms, herbicides registered for common bean are frequently used off-label on Vigna crops (Mancuso et al., 2016; Sinchana and Raj, 2020; Mekonnen et al., 2024). However, most of these herbicides are not officially registered for Vigna species in Brazil. Given the physiological and morphological differences between bean genera, such off-label applications may pose a risk of phytotoxicity to Vigna crops. The principal herbicides typically applied in common beans for selective weed control include bentazon, clethodim, haloxyfop, imazamox, lactofen, quizalofop, and S-metolachlor. Many of these compounds are applied as tank mixes or are available in commercial premixed formulations (Mapa, 2003).

Therefore, assessing the sensitivity of Vigna cultivars to herbicides commonly used in common bean cultivation, as well as evaluating the potential impact of predominant weeds such as *Commelina benghalensis*, is essential. Although Vigna cultivars generally demonstrate tolerance to adverse conditions, they may still be negatively affected by the improper application of herbicides designed for common bean (Mekonnen et al., 2024), and weeds such as *C. benghalensis* may reduce growth and yield (Hirani et al., 2024).

The increasing global demand for Vigna, combined with its nutritional value and tolerance to harsh environmental conditions, has encouraged expansion into the Brazilian Cerrado (Oliveira et al., 2021). However, the considerable genetic variability among Vigna cultivars, alongside limited knowledge regarding the adaptation of specific varieties within the Central-West and Southeast regions, emphasizes the need for targeted research on cultivar-specific responses to agronomic management and chemical inputs (Sen and De, 2017; Dairo, 2024). Thus, this study aims to evaluate the sensitivity of Vigna cultivars to herbicides commonly used in common bean production and to assess the interference caused by *C. benghalensis*.

2. Material and Methods

Two greenhouse experiments were conducted, the first in November 2022 and the second in February 2023, using 10 dm^3 pots that were randomly distributed into four blocks within a randomized block design. Treatments were arranged in a 6 × 7 factorial scheme consisting of six Vigna cultivars: *V. unguiculata* (Itaim, Nova Era, Rouxinol, and Tumucumaque), *V. radiata* (Mungo Verde MG2), and *V. angularis* (Azuki); and seven management treatments, including five herbicide applications (Table 1), a weed-free control maintained by manual weeding, and a treatment in which each pot contained one *Commelina benghalensis* plant.

Table 1. Herbicides evaluated for selectivity in *Vigna* bean cultivars.

Herbicide	Rate (g ha^{-1})	Commercial product	Formulation	Concentration	Supplier
S-metolachlor	1150.0	Dual Gold®	Emulsifiable Concentrate	960 g L^{-1} a.i.	Syngenta
Quizalofop + fomesafen	25.0 + 225.0	Targa® Max + Flex®	Emulsifiable Concentrate Soluble Concentrate	50 g L^{-1} a.i. 250 g L^{-1} a.i.	Ihara Syngenta
Bentazon + imazamox	600.0 + 28.0	Amplo®	Soluble Concentrate	600 and 28 g L^{-1} a.i.	Basf
Clethodim + fomesafen	84.0 + 225.0	Select® +Flex	Emulsifiable Concentrate Soluble Concentrate	240 g L^{-1} a.i. 250 g L^{-1} a.i.	UPL Syngenta
Lactofen + haloxyfop	120.0 + 18.0	Naja® Missil®	Emulsifiable Concentrate	240 g L^{-1} a.i. 520 g L^{-1} a.e.	Adama UPL

The soil used in the pots, whose chemical and physical characteristics are presented in Table 2, was fertilized with 0.5 kg m^{-3} of NPK (4:14:8). All seeds were treated with thiophanate-methyl (0.25 g kg^{-1}), and ten seeds were sown per pot at a depth of 3.0 cm, evenly spaced. Throughout crop development, a drip irrigation system maintained soil moisture at approximately 70% of field capacity until 10 days before harvest. After the emergence assessment, seedlings were thinned to two plants per pot, and the pots were spaced 0.7 m apart. In the interference treatment, one *C. benghalensis* seedling at the two-leaf stage (approximately 5 cm tall) was transplanted into each pot 14 days after sowing.

S-metolachlor was applied immediately after sowing, whereas all post-emergence herbicides were sprayed 25 days after crop emergence, corresponding to the V4–V5 growth stage. For spraying, the pots were temporarily removed from the greenhouse and treated using a CO_2-pressurized backpack sprayer equipped with pressure regulators and a 1.5-m boom fitted with four Hypro Guardian GRD120-02 nozzles positioned 50 cm above the plant canopy. During application, wind speed ranged from 3.0 to 4.0 km h^{-1}, air temperature from 22 to 26 °C, and relative humidity from 50% to 60%.

Seedling emergence was assessed 14 days after sowing for S-metolachlor and the corresponding untreated control. Herbicide injury was visually evaluated at 4 and 14 days after application (DAA) using a 0–10 scale (0 = no injury; 10 = plant death), following the guidelines of EWRC (1964) and SBCPD (1995). Evaluations were performed independently by three trained observers familiar with the herbicides' mechanisms of action. Plant height and number of leaves were also recorded at 4 and 14 DAA.

Table 2. Soil characterization of the experiments.

P meh^{-1}	S-$SO_4^{=}$	B	Cu	Fe	Mn	Zn
mg dm^{-3}						
162.8	41.0	1.39	3.8	28	15.7	9.5
Organic matter	Sand	Silt	Clay	Textural class		
%						
3.9	40	17	43	Clay loam		
pH H_2O	K^+	Ca^{2+}	Mg^{2+}	Al^{3+}	H + Al	
cmol$_c$ dm^{-3}						
6.0	2.27	4.0	2.4	0.0	1.90	

All emerging weeds were manually removed during the experimental period. To control *Myzus persicae*, acetamiprid (300 mL 100 L^{-1}) was applied, and powdery mildew (*Microsphaera diffusa*) was managed with chlorothalonil (500 mL 100 L^{-1}). All plants were staked to ensure adequate support. Harvest occurred at physiological maturity (R9 stage), beginning at approximately 75 days after sowing and continuing until 120 days, depending on the cultivar. Pods were harvested weekly and stored at 8 °C until processing.

The variables recorded included the number of pods per plant, the number of grains per pod, the number of grains per plant, and the grain weight adjusted to 13% moisture. Prior to analysis, data were tested for normality of residuals and homogeneity of variances. Due to inherent differences in development and productivity among cultivars, growth and yield data were analyzed separately for each cultivar. Treatment means were compared using Tukey's test at the 5% significance level.

3. Results and discussion

The two greenhouse experiments showed similar tendencies across all measured variables and were therefore pooled for analysis. Cultivar and treatment effects were significant for emergence, injury, vegetative growth, and yield components.

In the untreated control, *V. angularis* (Azuki), *V. radiata* (Mungo Verde MG2), and the *V. unguiculata* cultivars Itaim and Rouxinol exhibited 100% emergence, whereas Nova Era and Tumucumaque reached 93% and 80%, respectively. S-metolachlor applied at planting caused a pronounced reduction in emergence: >90% in Azuki, ~80% in Mungo Verde MG2, ~33% in Rouxinol, and ~13% in Tumucumaque. No statistically significant reduction was detected for Itaim or Nova Era (Table 3). The heightened sensitivity of Azuki and Mungo Verde MG2 is likely related to seed size, as both possess seeds approximately 50% smaller than those of the other genotypes evaluated (Abud et al., 2022), a trait known to reduce tolerance to pre-emergence VLCFA-inhibiting herbicides, such as S-metolachlor.

Table 3. Emergence (%) of *Vigna* spp. bean seedlings in soil with S-metolachlor.

Vigna bean cultivars	S-metolachlor (applied at planting)	No herbicide
V. angularis (Azuki)	6.6 b	100 a
V. radiata (Mungo verde MG2)	20.0 b	100 a
V. unguiculata (Itaim)	80.0 a	100 a
V. unguiculata (Nova Era)	73.2 a	93.2 a
V. unguiculata (Rouxinol)	66.6 b	100 a
V. unguiculata (Tumucumaque)	66.6 b	80.0 a
CV (%)	23.0	

Averages followed by the same letter in the same line are equal according to the F-test with 5% significance.

Herbicide injury scores varied markedly by cultivar and herbicide group (Table 4). Azuki was the most sensitive genotype, with injury scores >8.0 at 4 DAA following quizalofop+fomesafen and S-metolachlor; clethodim+fomesafen and lactofen+haloxyfop induced intermediate injury (~5.0), whereas bentazon+imazamox produced only mild symptoms. Mungo Verde MG2 displayed minimal injury across treatments, showing no symptoms with bentazon+imazamox, clethodim+fomesafen, or quizalofop+fomesafen, and only slight injury with lactofen+haloxyfop. Among *V. unguiculata* cultivars, Itaim exhibited moderate phytotoxicity to clethodim+fomesafen, lactofen+haloxyfop, and quizalofop+fomesafen but low sensitivity to bentazon+imazamox and S-metolachlor; Nova Era and Rouxinol were primarily affected by quizalofop+fomesafen (≈6.7), and Tumucumaque showed no response to bentazon+imazamox but high sensitivity to quizalofop+fomesafen and intermediate responses to S-metolachlor, lactofen+haloxyfop, and clethodim+fomesafen. By 14 DAA, most injuries diminished, indicating recovery through metabolic detoxification or compartmentalization; limited exceptions included small increases in symptoms for Itaim and Mungo Verde MG2 after bentazon+imazamox and for Rouxinol after S-metolachlor, changes that were minor and unlikely to affect final productivity (Table 4).

Table 4. Herbicide injury in *Vigna* spp. bean cultivars according to EWRC (1964) and SBCPD (1995).

Herbicides	*V. angularis* (Azuki)	*V. radiata* (Mungo verde MG2)	*V. unguiculata* (Itaim)	*V. unguiculata* (Nova Era)	*V. unguiculata* (Rouxinol)	*V. unguiculata* (Tumucumaque)
			4 days after application			
bentazon+imazamox	3.67 Ba	0.00 Aa	0.33 Aa	1.33 Aa	0.67 Aa	0.00 Aa
clethodim+fomesafen	5.00 Ba	0.00 Aa	4.00 Bb	4.33 Bb	4.33 Bb	4.33 Bc
lactofen+haloxyfop	5.33 Ca	0.33 Aa	5.67 Cb	4.33 Cb	2.33 Ba	3.00 Bb
quizalofop+fomesafen	8.67 Cb	0.00 Aa	6.00 Bb	6.67 Bc	6.67 Bc	6.67 Bd
S-metolachlor	8.33 Cb	4.33 Bb	1.67 Aa	0.67 Aa	1.67 Aa	2.33 Ab
CV (%)			32.04			
			14 days after application			
bentazon+imazamox	2.33 Aa	0.33 Aa	1.00 Aa	0.67 Aa	0.00 Aa	0.00 Aa
clethodim+fomesafen	3.67 Ba	0.00 Aa	4.67 Bb	4.00 Bb	2.67 Ba	4.33 Bb
lactofen+haloxyfop	3.67 Aa	0.67 Aa	3.33 Ab	2.67 Ab	1.67 Aa	1.67 Aa
quizalofop+fomesafen	8.00 Db	0.00 Aa	5.67 Cb	5.67 Cb	3.33 Ba	4.67 Cb
S-metolachlor	8.66 Cb	4.67 Bb	0.33 Aa	0.00 Aa	2.33 Aa	0.00 Aa
CV (%)			33.46			

Means followed by the same letters, lowercase within columns and uppercase within rows, do not differ according to Tukey's test at the 5% significance level.

Vegetative responses paralleled injury patterns. At 4 DAA, Azuki height was substantially reduced by quizalofop+fomesafen and S-metolachlor, Mungo Verde MG2 was affected only by S-metolachlor, and Itaim exhibited height reductions across all herbicide treatments, with the largest decrease (≈55%) caused by S-metolachlor. Nova Era height decreased after clethodim+fomesafen, lactofen+haloxyfop, quizalofop+fomesafen, and S-metolachlor, while Rouxinol was reduced by fomesafen-containing mixtures and S-metolachlor; Tumucumaque maintained height across treatments at 4 DAA (Table 5). By 14 DAA, many cultivars recovered, but quizalofop+fomesafen and S-metolachlor continued to depress height in the most sensitive genotypes (e.g., Azuki and Itaim), with S-metolachlor producing persistent reductions consistent with its soil residual activity and effects on root volume and early water/nutrient uptake (Székács, 2021). Fomesafen mixtures reduced height plausibly via membrane lipid peroxidation and reduced photosynthetic area (Hess and Weller, 2000). Tumucumaque's stability suggests intrinsic tolerance mechanisms such as enhanced metabolic degradation or limited translocation.

Table 5. Plant height (cm) of *Vigna* spp. bean cultivars treated with herbicides or subjected to interference by *Commelina benghalensis*.

Herbicides	*V. angularis* (Azuki)	*V. radiata* (Mungo verde MG2)	*V. unguiculata* (Itaim)	*V. unguiculata* (Nova Era)	*V. unguiculata* (Rouxinol)	*V. unguiculata* (Tumucumaque)
			4 days after application			
bentazon+imazamox	33.00 a	30.5 a	37.67 b	39.67 a	36.67 a	35.33 a
clethodim+fomesafen	24.83 a	27.17 a	32.33 c	25.17 b	26.00 b	28.67 a
lactofen+haloxyfop	33.83 a	29.00 a	36.67 c	27.00 b	38.17 a	35.67 a
quizalofop+fomesafen	6.17 b	25.67 a	32.50 c	25.33 b	27.83 b	22.83 a
S-metolachlor	5.33 b	14.33 b	27.17 c	27.00 b	23.83 b	25.17 a
manual weeding	29.17 a	29.83 a	60.33 a	35.33 a	32.83 a	31.50 a
with *C. benghalensis*	28.67 a	32.33 a	54.17 a	36.17 a	35.83 a	33.00 a
CV(%)			21.62			
			14 days after application			
bentazon+imazamox	74.33 a	43.33 a	73.83 a	64.50 a	71.17 a	77.67 a
clethodim+fomesafen	47.17 a	43.83 a	45.17 b	35.17 a	44.67 b	53.00 a
lactofen+haloxyfop	71.67 a	38.17 a	83.50 a	38.33 a	83.00 a	80.17 a
quizalofop+fomesafen	20.17 b	37.00 a	39.83 b	29.33 a	38.67 b	29.50 a
S-metolachlor	8.17 b	24.67 a	59.83 b	33.67 a	41.33 b	53.67 a
manual weeding	68.33 a	36.67 a	103.50 a	36.83 a	68.83 a	55.00 a
with *C. benghalensis*	72.67 a	42.00 a	90.83 a	53.33 a	66.17 a	57.83 a
CV(%)			36.16			

Averages followed by the same letters in the column do not differ from each other according to the Tukey test at a 5% significance level.

A single *Commelina benghalensis* plant per pot did not affect height, leaf number, or yield components in any cultivar. This lack of interference likely reflects the experimental conditions adequate water and nutrients, later weed establishment (transplanted 14 DAS), and canopy shading by the crop and aligns with previous reports of Vigna tolerance to early weed presence under non-limiting resources (Pinto et al., 2022).

Leaf number was reduced at 4 DAA mainly by S-metolachlor (Azuki, Itaim, Rouxinol) and quizalofop+fomesafen (all except Mungo Verde MG2); lactofen+haloxyfop reduced leaves in Itaim, Nova Era, and Rouxinol, whereas clethodim+fomesafen spared Azuki and Mungo Verde MG2 at the early interval (Table 6). By 14 DAA, most cultivars recovered leaf production, although quizalofop+fomesafen continued to reduce leaf number in Azuki, Itaim, and Nova Era, and clethodim+fomesafen still reduced leaf number in Itaim and Nova Era. Given the role of early leaf area in carbohydrate accumulation and in defining the critical weed-free period, persistent leaf deficits in sensitive cultivars can compound yield loss risks (Kocira and Staniak, 2021).

Table 6. Number of leaves (per plant) of *Vigna* spp. bean cultivars treated with herbicides or subjected to interference by *Commelina benghalensis*.

Herbicides	*V. angularis* (Azuki)	*V. radiata* (Mungo verde MG2)	*V. unguiculata* (Itaim)	*V. unguiculata* (Nova Era)	*V. unguiculata* (Rouxinol)	*V. unguiculata* (Tumucumaque)
			4 days after application			
bentazon+imazamox	8.67 a	9.17 a	14.83 a	14.67 a	13.00 a	10.17 a
clethodim+fomesafen	5.17 a	10.00 a	6.33 c	5.00 c	5.83 c	5.33 b
lactofen+haloxyfop	7.83 a	9.67 a	10.17 b	9.17 b	10.17 b	11.50 a
quizalofop+fomesafen	2.00 b	8.00 a	4.33 c	3.17 c	5.67 c	3.67 b
S-metolachlor	2.33 b	7.00 a	10.33 b	13.00 a	9.00 b	9.33 a
manual weeding	10.00 a	9.17 a	14.83 a	15.00 a	14.17 a	12.67 a
with *C. benghalensis*	8.67 a	9.00 a	13.00 a	13.50 a	14.17 a	12.50 a
CV (%)			26.17			
			14 days after application			
bentazon+imazamox	8.83 a	10.83 a	18.67 a	15.67 a	16.50 a	12.83 a
clethodim+fomesafen	9.17 a	11.33 a	11.17 b	6.17 b	11.67 a	11.17 a
lactofen+haloxyfop	9.33 a	10.67 a	13.17 b	15.17 a	13.67 a	15.83 a
quizalofop+fomesafen	3.00 b	11.50 a	7.00 c	5.50 b	14.33 a	8.17 a
S-metolachlor	3.00 b	7.33 a	15.00 a	14.17 a	12.17 a	12.00 a
manual weeding	13.17 a	10.67 a	17.33 a	17.00 a	16.17 a	14.00 a
with *C. benghalensis*	11.00 a	10.33 a	19.00 a	17.83 a	17.33 a	14.00 a
CV(%)			25.33			

Averages followed by the same letters in the column do not differ from each other according to the Tukey test at a 5% significance level.

Yield components reflected the cumulative impact of early injuries. S-metolachlor reduced grains per pod in Azuki and Rouxinol. Quizalofop+fomesafen did not reduce grains per pod in Rouxinol, indicating a cultivar-specific tolerance interaction. Grain weight per plant decreased in Azuki when treated with bentazon+imazamox, quizalofop+fomesafen, and S-metolachlor; Mungo Verde MG2 was negatively affected only by S-metolachlor; Itaim experienced reductions with clethodim+fomesafen and lactofen+haloxyfop; Nova Era was reduced by quizalofop+fomesafen; and Rouxinol by lactofen+haloxyfop. Importantly, *C. benghalensis* interference did not reduce grain weight or the number of grains per pod in any cultivar (Table 7).

Overall, mixtures commonly used in common bean and soybean production (bentazon + imazamox, clethodim + fomesafen, lactofen + haloxyfop, quizalofop + fomesafen) displayed acceptable selectivity in most Vigna cultivars under greenhouse conditions, with transient injuries and modest yield impacts when recovery occurred. Conversely, the severe reduction in emergence caused by S-metolachlor in Azuki and Mungo Verde MG2 (and to a lesser extent in Rouxinol and Tumucumaque) represents a critical limitation for its blanket use in Vigna cropping systems despite its registration for common bean; safeners may mitigate risk (Deng, 2022), but their efficacy and availability for Vigna remain uncertain. The observed genotype-dependent responses underscore the feasibility of selecting or breeding Vigna cultivars with enhanced herbicide tolerance and support the cautious, cultivar-specific integration of these herbicides into Cerrado production systems.

Table 7. Grains per pod and total grain weight in *Vigna* spp. bean subjected to herbicide application and under interference by *C. benghalensis*.

Herbicides	*V. angularis* (Azuki)	*V. radiata* (Mungo verde MG2)	*V. unguiculata* (Itaim)	*V. unguiculata* (Nova Era)	*V. unguiculata* (Rouxinol)	*V. unguiculata* (Tumucumaque)
			Number of grains per pod			
bentazon+imazamox	6.94 a	10.82 a	9.63 a	7.84 a	12.70 b	11.66 a
clethodim+fomesafen	8.53 a	9.67 a	8.36 a	5.80 a	12.53 b	11.03 a
lactofen+haloxyfop	7.00 a	10.10 a	7.31 a	7.78 a	11.37 b	8.68 a
quizalofop+fomesafen	9.17 a	8.91 a	8.98 a	7.10 a	13.68 a	10.78 a
S-metolachlor	2.98 b	10.57 a	8.77 a	7.23 a	10.75 b	12.06 a
manual weeding	7.77 a	11.88 a	9.26 a	6.36 a	15.96 a	8.86 a
with *C. benghalensis*	7.01 a	9.93 a	8.97 a	8.39 a	10.12 b	10.38 a
CV (%)			23.00			
			Total grain weight per plant (g plant^{-1})			
bentazon+imazamox	49.97 b	53.77 a	93.97 a	89.8 a	76.30 a	109.9 a
clethodim+fomesafen	73.10 a	60.40 a	49.60 b	69.80 a	66.17 a	92.47 a
lactofen+haloxyfop	74.63 a	47.77 a	65.27 b	86.37 a	41.47 b	88.17 a
quizalofop+fomesafen	24.47 b	48.90 a	99.83 a	36.50 b	60.80 a	86.73 a
S-metolachlor	20.23 b	30.87 b	109.0 a	75.30 a	65.70 a	104.2 a
manual weeding	93.83 a	40.60 a	126.6 a	64.00 a	93.2 a	95.63 a
with *C. benghalensis*	107.6 a	55.50 a	98.70 a	63.30 a	83.53 a	93.53 a
CV (%)				26.81		

For each variable, averages followed by the same letters in the column do not differ from each other according to the Tukey test at a 5% significance level.

4. Conclusions

Herbicide selectivity varies markedly among *Vigna* cultivars. S-metolachlor caused severe reductions in seedling emergence in *V. angularis*, *V. radiata*, and some *V. unguiculata* cultivars, indicating low preemergence tolerance.

The post-emergence mixtures bentazon + imazamox, clethodim + fomesafen, lactofen + haloxyfop, and quizalofop + fomesafen caused visible injury but generally allowed plant recovery; yield reductions occurred only for specific cultivar–herbicide combinations.

Interference from a single *Commelina benghalensis* plant did not affect growth or yield in any cultivar.

These findings demonstrate that herbicide selectivity in Vigna is cultivar-dependent and that *C. benghalensis* interference at low densities does not compromise crop performance.

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