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Seed size and its effects on the physiological quality of produced seeds[1]

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ABSTRACT - The physiological quality of soya bean seeds is a determining factor in establishing the crop in the field. The aim of the present study was to evaluate the physiological quality of soya bean seeds produced by plants grown from seeds of different sizes in two crop seasons. The BS 2606 SOYTECH, NS 6700 IPRO, NA 5909 RR, BS IRGA 1642 IPRO and LANÇA 58i60 IPRO cultivars were used, sown in 2019/2020 and 2020/2021. The experimental design was of randomised blocks, with treatments comprising seeds from plants grown from seeds of three sieve sizes (5.5, 6.0 and 6.5 mm for cultivars BS2606, NS 6700 IPRO, NA 5909 RR, LANÇA; and 6.0, 6.5 and 7.0 mm for the BS IRGA 1642 IPRO cultivar). The following tests were conducted: germination, first germination count, shoot and root length, total seedling dry weight, seedling emergence, accelerated ageing and electrical conductivity. The results were subjected to analysis of variance, and the mean values were compared using Tukey's test at 5% probability. The size classification of the soya bean seeds has no effect on the germination of the seeds that are produced. Higher seed vigour in the NA 5909 RR cultivar, determined by the seedling emergence test, and accelerated ageing in NS 6700 IPRO, were obtained from seeds produced by plants grown from seeds classified as a sieve size of 6.5 mm. For the other cultivars, the size classification of the seeds had no effect on the vigour of the produced seeds.

Key words: *Glycine max* L. Merrill. germination. classification. sieves. vigour.

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INTRODUCTION

The soya bean (*Glycine max* L. Merrill) is one of the world's most important agricultural crops (Seixas *et al*., 2020). In the 2022/23 crop season, Brazil had a production of 154,617.4 million tons, and is considered the largest producer of soya beans in the world (CONAB, 2023).

The oilseed is the raw material for countless products. Its grain is rich in oil, proteins, fatty acids and vitamins, and is used for a wide range of purposes, including human and animal food, biofuel production and lubricants, among others (Ávila *et al*., 2007). It plays a major role in various market sectors; however, its main use is as raw material in the production of oil and bran (Pípolo *et al*., 2015).

A very important factor when planting soya beans is the quality of the seeds, which are responsible for transferring to the field the genetic characteristics that determine the performance of the cultivar, making a decisive contribution to the successful establishment of the crop (Marcos Filho, 2015). The use of high-vigour seeds when planting soya beans has a positive effect on the entire crop cycle, from initial establishment to seed production (Bagateli *et al*., 2019; Pimentel *et al*., 2017; Robrigues *et al*., 2018). In general, plants of higher vigour form larger photosynthetic areas from the start of development, and produce more dry matter than do plants derived from low-vigour seeds (Kolchinski; Schuch; Peske, 2006).

The vigour of seed batches can be influenced by various factors, such as the size of the seeds (Soares *et al*., 2015). Larger or denser seeds have more nutrient reserves for the embryo, and are potentially the most vigorous (Peripolli *et al*., 2019). In general, the more reserves available for embryonic development, the better the initial development of the seedling, ensuring uniform stands and greater seed productivity (Mazon *et al*., 2022).

However, in some soya bean cultivars, seed size has no effect on vigour or crop productivity (Camozzato *et al*., 2009; Conceição *et al*., 2023; Piccinin *et al*., 2012). The effect of seed size on the establishment and productivity of the crop is therefore intrinsic to the genotype and production environment of the plants, and it cannot be assumed that larger seeds will always result in more productive plants (Conceição *et al*., 2023) or the formation of seeds of better physiological quality.

Several studies have addressed the physiological quality of seeds based on their size. Peripolli *et al*. (2019) analysed seeds from three soya bean cultivars (NA 5909 RR and BMX Valente RR), classified into sieve sizes of 5.5 and 7.0 mm, and found a higher rate of germination and greater radicle size for smaller seeds. Pádua *et al*. (2010), evaluating three cultivars (BRSMG 752S, BRSMG 790A and BRSMG 750SRR) and three sizes of seed (6.0, 6.5 and 7.0 mm), found that larger seeds (7. 0 mm) achieved better results in the germination and accelerated-ageing test. Studies by Piccinin *et al*. (2012), Soares *et al*. (2015) and Derre *et al*. (2017), concluded that the size classification of the seeds has no effect on germination, speed of emergence or initial vigour.

However, there is a lack of studies that evaluate the physiological quality of seeds obtained from crops grown from seeds of different sizes (Scarbossa *et al*., 2021) (Scarbossa *et al*., 2021).

As such, the aim of the present study was to evaluate the physiological quality of soya bean seeds produced by plants grown from seeds classified into different sieve sizes.

MATERIAL AND METHODS

The experiments were conducted in the district of Lauro Muller in the state of Santa Catarina (18°46'17.9 S; 52°37'25.0" W, at an average altitude of 260 m) during the 2019/2020 and 2020/2021 crop seasons, called Seasons 1 and 2, respectively.

According to the Köppen classification, the climate in the region is humid mesothermal with hot summers (Cfa), an average annual rainfall of 1400 mm and average annual temperature of 19 °C. Monthly climate data from sowing to harvest (Figure 1) were obtained from the automatic weather station of the Company for Agricultural Research and Rural Extension of Santa Catarina.

A randomised-block experimental design was used, the treatments comprising three sieve sizes, with four replications per treatment. Five soya bean cultivars (Table 1) were used for each size, grown independently during two crop seasons (2019/2020 and 2020/2021).

The seeds of the soya bean cultivars used for Season 1 were categorised as C1, and came from the Lannes seed company in the district of São Gabriel, Rio Grande do Sul. The seeds then produced in Season 1 in the district of Lauro Muller, Santa Catarina, were used to plant the second crop.

The Brazilian classification standard, used in soya bean seed processing plants, was used to classify the seeds by size (EMBRAPA, 2005). Classification was carried out manually, employing a set of round-hole sieves placed one above the other in descending order of size (7.5, 7.0, 6.5, 6.0, 5.5 and 5.0 mm). The seeds with the highest percentage retained on the sieves were used in the experiment, as shown in Table 1.

Figure 1 - Average monthly rainfall and temperature (maximum and minimum) recorded throughout the crop cycle for Seasons 1 and 2. (Urussanga weather station)

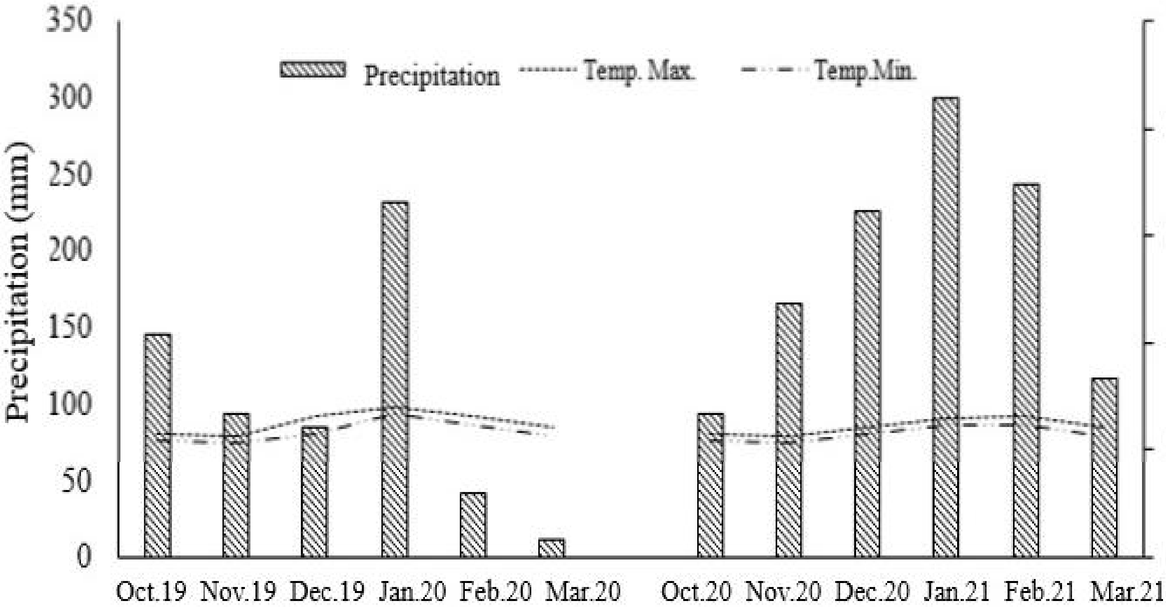


Table 1 - Classes of sieve size in relation to the percentage distribution of seeds, and one thousand seed weight (TSW) within each class, for each cultivar and crop season

Cultivar	Sieve	Season 1 (%)	TSW	Season 2 (%)	TSW
	5.5	24.6	116.64	7.9	115.02
BS 2606 SOYTECH	6	49.8	142.91	37.1	145.48
	6.5	20.4	174.23	39.9	177.68
	5.5	15.6	118.83	4.4	119.93
NS 6700 IPRO	6	43.1	147.69	30.1	152.35
	6.5	33.3	179.33	52.5	183.85
	5.5	20.9	117.37	20.9	115.75
NA 5909 RR	6	46.2	140.23	46.2	146.3
	6.5	25.7	170.03	53.2	176.65
	6	22	149.69	3.4	148.88
BS IRGA 1642 IPRO	6.5	40	181.16	20.5	183.67
	7	26	217.31	49.1	217.23
	5.5	15.9	110.03	1.3	117.23
LANÇA 58i60 IPRO	6	33.5	143.65	12.1	146.02
	6.5	39.5	173.82	45.2	184.24

After classification, the seeds were packed in paper bags and placed in a cold room (17 °C) until sowing. Based on the Brazilian System of Soil Classification, the soil in the experimental area was classified as an argisol (Santos *et al*., 2018). Before starting the experiment, a subsoiler was used to loosen the soil, which was sampled in the 0-0.15 m layer. A chemical analysis showed that the soil had the following characteristics: pH (water) = 5.42, organic matter (%, w/v) = 4.3, phosphorus, P-Mehlich (mg dm^{-3}) = 21.7, potassium ($cmol_c$ dm^{-3}) = 0.938, aluminium ($cmol_c$ dm^{-3}) = 0.2, calcium ($cmol_c$ dm^{-3}) = 9.5, magnesium ($cmol_c$ dm^{-3}) = 4.5 H + Al ($cmol_c$ dm^{-3}) = 5.2, CEC (pH 7, $cmol_c$ dm^{-3}) = 14.7 and base saturation (%) = 74.3.

The experiments were set up under a direct sowing system on a straw of black oats, dried by applying glyphosate (Atanor 48®) at a dose of 3 L ha^{-1} 30 days before sowing. The application was carried out using a CO^2 pressurised backpack sprayer equipped with an AXI 110.15 series spray bar with four nozzles spaced 0.5 m apart, adjusted for a flow rate of 120 L ha^{-1}.

The soya beans for Season 1 were sown on 25 October 2019, and for Season 2, on 1 October 2020, using a portable hand seeder (Saraqua) adjusted to deposit three seeds per hole. Thinning was carried out 21 days after emergence, leaving only one plant per hole. Base fertiliser consisted of 200 kg ha^{-1} 05-20-20 formulation (N-P-K), broadcast on the same day as the seeds were sown.

Cropping treatments for the soya bean, such as the control of weeds, insect pests and diseases, were carried out as per the technical recommendations for soya bean cultivation (EMBRAPA, 2011).

For Season 1, each experimental plot consisted of five rows, four metres in length, with a spacing of 0.5 m between rows and 0.5 m between plants, giving an area of 2.5 m x 4 m (10 m^2) for each plot. For harvesting the plants, the working area of the plot was considered to be 3 m^2. For Season 2, the experimental plots comprised 5 rows of 4 metres, with a spacing of 1.0 m between rows and 1.0 m between plants, for an area of 4 m x 5 m (20 m^2) per plot. The working area of the plot for harvesting the plants was considered to be 6 m^2.

Five plants per plot were harvested manually at stage R8 regardless of the crop season. The pods were then threshed by hand and the seeds placed in duly identified paper bags and sent to the Seed Analysis Laboratory (LAS) of the Department of Plant Science of the Eliseu Maciel School of Agronomy at the Federal University of Pelotas, Rio Grande do Sul (FAEM/UFPel), where the water content and physiological quality of the seeds were determined using the following tests:

Germination test: conducted with four replications of 50 seeds for each treatment. The seeds of the cultivars were placed between three sheets of rolled germitest paper, and moistened with water at 2.5 times the weight of the dry paper. The rolls were placed in a germinator at 25 °C. The evaluations were carried out on the fifth (first germination count) and eighth day after sowing, with the results expressed as a percentage of normal seedlings, based on criteria established by the Rules for Seed Analysis - RAS (Brazil, 2009).

First germination count: carried out together with the germination test to calculate the percentage of normal seedlings obtained on the fifth day after sowing (Brasil, 2009).

Shoot and primary root length: twenty soya bean seeds were used, sown longitudinally on the upper third of germitest paper (Krzysanowski *et al*., 2020), which had previously been moistened with distilled water at 2.5 times the dry weight of the paper. The rolls were packed in plastic bags and placed vertically in the germinator for seven days at 25 ºC. At the end of this period, the parts of any emerged normal seedlings (primary root and hypocotyl) were measured using a ruler. The average results per seedling were expressed in centimetres.

Seedling dry weight: following the test for length, the seedlings were placed in paper bags and dried in a forced air circulation oven at 65 ºC for 72 h to determine the dry weight. After this period, the samples were left to cool in a desiccator, and weighed on a precision balance. The results were expressed in g/replication.

Accelerated ageing: a single layer of seeds was placed on an aluminium screen in plastic boxes containing 40 mL of distilled water. The plastic boxes were covered and kept in an incubator at a constant temperature of 41 °C for 48 hours. The seeds were then left to germinate following the same methodology described for the germination test. The number of normal seedlings was evaluated on the fifth day and the results expressed as a percentage. (Krzysanowski *et al*., 2020).

Field emergence: 100 seeds from each experimental unit were sown in seedbeds in two replications. The evaluation was carried out in a single count of normal seedlings 21 days after sowing, with the results expressed as a percentage (Tillmann; Tunes; Almeida, 2019).

Electrical conductivity: carried out in four replications of 25 seeds, which were weighed on a balance with a precision of 0.001 g, and left to soak for 24 hours at 25 ºC in 100-mL disposable cups containing 75 mL of deionised water. The conductivity of the soaking solution was then determined using a Digimed conductivity meter (model DM 31), with the results expressed in $\mu S\ cm^{-1}\ g^{-1}$ of seed (Krzysanowski *et al*., 2020).

The experimental data were submitted to analysis of variance (ANOVA) and, when significant, the mean values were compared by Tukey's test at a probability level of 5% using the Sisvar® statistical software (Ferreira, 2011). No comparisons were made between the cultivars or crop seasons.

RESULTS AND DISCUSSION

The moisture content of the soya bean seeds from both harvests was similar, ranging from 10.09% to 13.62% in Season 1, and 11.07% to 13.62% in Season 2, showing that the water content had no effect on the results of the other tests. Variations in the water content of the seeds are within the accepted limit, which is up to 3.5 percentage points between samples (Marcos Filho, 2015). Uniform values for water content are essential for validating the tests and evaluating the physiological quality of the seeds (Bisognin *et al.*, 2016). It is known that controlling the seed moisture content is of fundamental importance, as excess moisture accelerates the metabolism of the seeds, directly affecting several aspects of their physiological quality (Sarmento *et al*., 2015).

An analysis of Figure 2 shows that there was no statistical difference in germination for the seeds produced by the BS2606 SOYTECH, NS 6700 IPRO, BS IRGA 1642 IPRO and LANÇA 58i60 IPRO cultivars from S1, S2 or S3 in either season. However, for cultivar NA5909 RR (Season 2) classified as S1 (5.5 mm), the produced seeds showed 85% germination, similar to the results of those from S3 (6.5 mm), which in turn showed no difference from the results of S2 (6.0 mm).

It should be noted that the germination percentages of the soya bean seeds in the present study met the minimum value (80%) required by the Ministry of Agriculture, Livestock and Supply for marketing the seeds (Brasil, 2013).

For the results of the first germination count (Seasons 1 and 2), the seeds produced from cultivars classified as S1, S2 and S3 showed no difference in vigour (Figure 3). However, there was a reduction in the germination value of seeds produced in Season 2. This reduction can be explained by the climate conditions during the crop cycle (Figure 1), with greater precipitation than Season 1, which has a direct effect on the physiological quality of the seeds that are produced.

According to Tunes *et al*. (2008), although the first count of the germination test is considered an indication of vigour, it is known that during the seed deterioration process, a reduction in the rate of germination is not among the first events related to seed deterioration. As such, it is not a very accurate test, as it does not detect processes prior to the death of the seed, neither does it identify small differences in vigour.

In relation to shoot length, seeds produced from cultivars classified into different sieve sizes (Season 2) gave rise to seedlings with similar-sized shoots (Figure 4A). In Season 2, the seeds produced from the BS2606 SOYTECH and NA5909 RR cultivars in S3 (6.5 mm) resulted in seedlings showing greater shoot development.

The results for root length (Figure 4 B) differ to those for the shoots. In Season 1, seeds produced by the BS2606 SOYTECH cultivar classified as S3 (6.5 mm), resulted in seedlings with a longer root length compared to those grown from seeds of 6.0 mm (S2).

Further in relation to Figure 4B, it appears that for Season 1, the seeds produced from the BS2606 SOYTECH, BS IRGA 1642 IPRO and LANÇA 58i60 IPRO cultivars, grown from S1, S2 and S3, gave rise to seedlings with an average root length of 7.49, 9.82 and 10.97 cm, respectively. However, the NS 6700 IPRO cultivar from S2 produced seeds that gave rise to plantlets with a longer root length than those from S3 (6.5 mm). For the NA 5909 RR cultivar from S1 (5.5 mm), the produced seeds resulted in seedlings with less root development than those from S3 (6.5 mm).

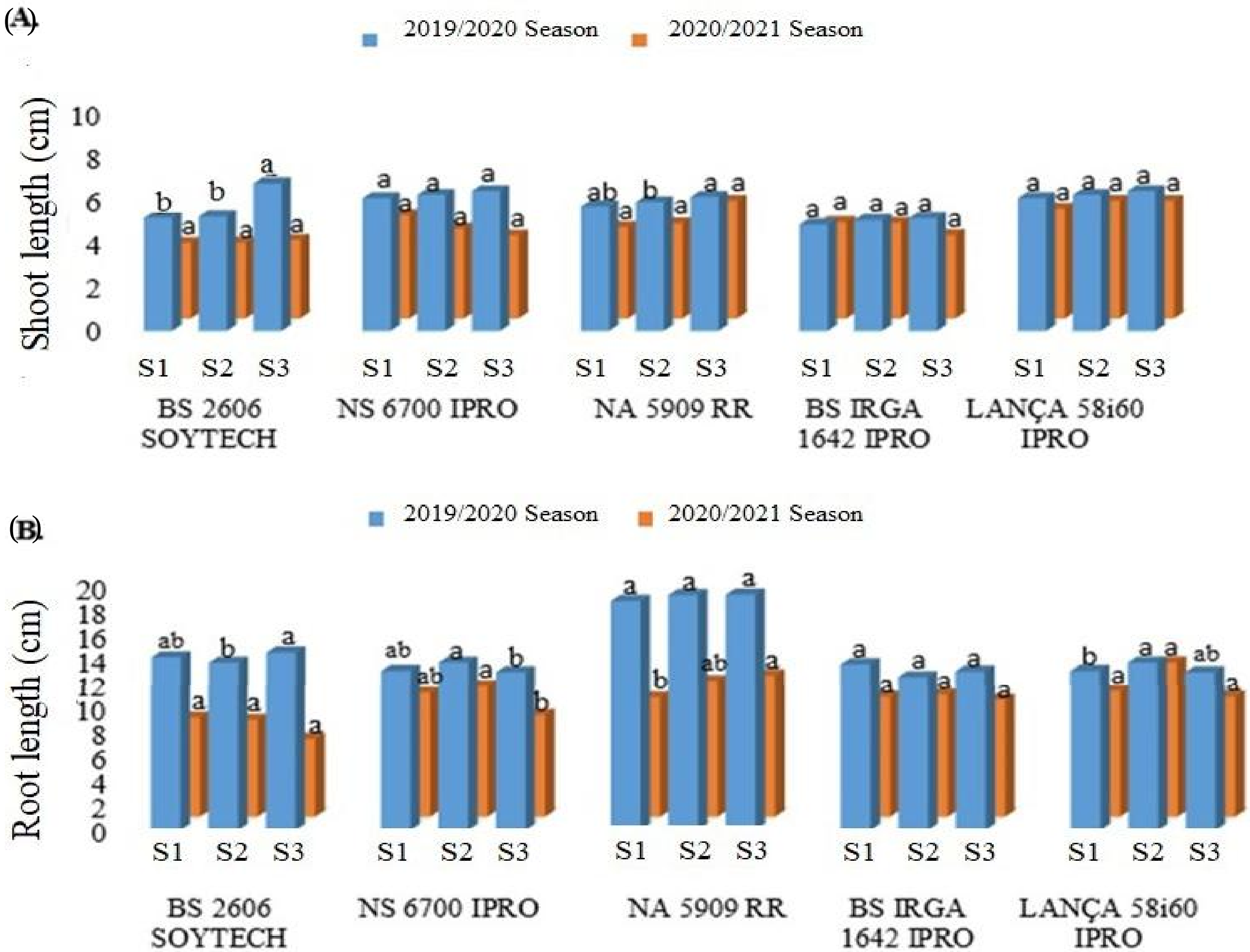
Figure 2 - Germination of soya bean seeds produced by cultivars classified into different sieve sizes in two crop seasons

For the same crop and cultivar, mean values followed by different lowercase letters on the bars differ significantly by Tukey's test at a level of 5%. S1 (5.5), S2 (6.0), S3 (6.5) – BS 2606 SOYTECH; NS 6700 IPRO; NA 5909 RR; LAUNCH 58i60 IPRO. S1(6.0), S2 (6.5), S3 (7.0) - BS IRGA 1642 IPRO

Figure 3 - First germination count in soya bean seeds produced by cultivars classified into different sieve sizes in two crop seasons

For the same crop and cultivar, mean values followed by different lowercase letters on the bars differ significantly by Tukey's test at a level of 5%. P1(5.5), P2 (6.0), P3 (6.5) – BS 2606 SOYTECH; NS 6700 IPRO; NA 5909 RR; LANÇA 58i60 IPRO. P1(6.0), P2 (6.5), P3 (7.0) - BS IRGA 1642 IPRO

Figure 4 - Shoot (A) and root (B) length in soya bean seedlings from seeds produced by cultivars classified into different sieve sizes in two crop seasons



For the same crop and cultivar, mean values followed by different lowercase letters on the bars differ significantly by Tukey's test at a level of 5%. P1(5.5), P2 (6.0), P3 (6.5) – BS 2606 SOYTECH; NS 6700 IPRO; NA 5909 RR; LANÇA 58i60 IPRO. P1(6.0), P2 (6.5), P3 (7.0) - BS IRGA 1642 IPRO

The results of the present study are not in line with those of Scarbossa *et al*. (2021), who found that soya bean seeds produced by the Nidera® NS 4823 cultivar, grown from seeds measuring 5.5 and 6.5 mm, formed seedlings that showed no difference in length or dry weight for either of the seasons under analysis.

For total dry weight (Figure 5), the BS2606 SOYTECH and NA 5909 RR cultivars from S3 (6.5 mm) produced seeds that gave rise to seedlings with a greater accumulation of dry weight compared to those from the 5.5-mm sieve (S1) in Season 1. However, NS 6700 IPRO and LANÇA 58i60 IPRO from S3 (6.5 mm) produced seeds that gave seedlings with a higher dry matter content than those from S2 (6.0 mm). No statistical difference was seen for the BS IRGA 1642 IPRO cultivar.

In relation to Season 2, the seeds produced by the BS IRGA 1642 IPRO cultivar from S2 and the LANÇA 58i60 IPRO cultivar from S1, gave rise to seedlings with a dry matter content similar to those produced from plants from S3.

Studies can be found in the literature related to seed size and its effect on germination and vigour that are different to the present research. Pádua *et al*. (2010), evaluating three cultivars (BRSMG 752S, BRSMG 790A and BRSMG 750SRR) and three sizes of soya bean seeds (6.0, 6.5 and 7.0 mm), concluded that larger seeds (7. 0 mm) gave better results in the germination and accelerated-ageing test. In a study by Bianchi *et al.* (2022) analysing two soya bean cultivars (M 5947 IPRO and 59HO124 IPRO) and three seed sizes (5.0, 6.0, 6.5 and 7.0 mm), the authors concluded that larger diameter seeds afforded greater physiological quality. Piccinin *et al*. (2012), studying nine batches of soya bean seeds, each represented by two sizes (5.5 and 6.5 mm), found that there was no difference between the seed sizes for germination or accelerated ageing. Peripolli *et al.* (2019), working with seeds from three soya bean cultivars (NA 5909 RR and BMX Valente RR) classified into the 5.5- and 7.0-mm sieve sizes, found a faster rate of germination and greater radicle size for smaller seeds.

It should be noted that the above studies are not unanimous in their results, nor do they evaluate, as does the present study, the relationship between the size of the seeds sown in the field and the physiological quality of those obtained from the crop, pointing to the need for further research in this area.

The results of the accelerated ageing test (Figure 6) for the seeds produced by the BS 2606 SOYTECH, NS 6700 IPRO, BS IRGA 1642 IPRO and LANÇA 58i60 IPRO cultivars, originating from S1, S2 and S3, showed no statistical difference (Seasons 1 and 2). However, the seeds produced by NA 5909 RR, from S3, showed 86% and 95% germination in Seasons 1 and 2, respectively, and are considered more vigorous than those from S2 (Seasons 1 and 2) and S1 (Season 2).

The largest seeds have the greatest reserves, and are potentially the most vigorous (Carvalho; Nakagawa, 2012). Plants grown from vigorous seeds have a higher growth rate (Bagateli *et al*., 2019; Kolchinski *et al*., 2006; Schuch; Kolchinski; Finatto, 2009) and larger leaf area (Rodrigues *et al*., 2018) and, as such, are more efficient in carrying out photosynthesis with a consequently greater capacity to store photoassimilates that contribute to seed formation. Seed development is highly dependent on a continuous supply of assimilated compounds, resulting from photosynthesis (Santos *et al*., 2023).

Figure 5 - Total dry weight in soya bean seedlings from seeds produced by cultivars classified into different sieve sizes in two crop

For the same crop and cultivar, mean values followed by different lowercase letters on the bars differ significantly by Tukey's test at a level of 5%. P1(5.5), P2 (6.0), P3 (6.5) – BS 2606 SOYTECH; NS 6700 IPRO; NA 5909 RR; LANÇA 58i60 IPRO. P1(6.0), P2 (6.5), P3 (7.0) - BS IRGA 1642 IPRO

The seeds produced in Season 1 by the cultivars under study showed no statistical difference in terms of seedling emergence (Figure 7), whereas those produced in Season 2 by the BS 2606 SOYTECH cultivar, from S3, showed a higher emergence percentage compared to those from S1. In the same season, seeds from the NA5909 RR cultivar from S3 showed a higher emergence percentage compared to those from S1 and S2. However, there was no statistical difference in emergence for the NA6700 IPRO, BS IRGA 1642 IPRO and LANÇA 58i60 IPRO cultivars.

The test of electrical conductivity is based on the principle that when seeds are immersed in water until the cell membranes reorganise, they leach sugars, enzymes, nucleotides, fatty acids, organic acids, amino acids, proteins and inorganic compounds, such as phosphates and K^+, Ca^+, Na^{ions+} and Mg^+ (Prado *et al*., 2019). Lower values for electrical conductivity therefore indicate greater integrity of the cell membranes and the release of fewer solutes (Krzysanowski *et al*., 2020). On the other hand, high electrical conductivity is the result of a greater flow of cellular constituents from the seed, resulting in deterioration and loss of vigour (Zucareli *et al*., 2016).

Analysing the results for electrical conductivity (EC) (Figure 8), there was no statistical difference for BS2606 SOYTECH, NA 5909 RR, BS IRGA 1642 IPRO or LANÇA 58i60 IPRO in either season. However, for the NS 6700 cultivar (Season 1), the seeds produced by plants grown from S3 seeds leached more solutes (85.98 mS cm^{-1} g^{-1}) compared to the other treatments.

Figure 6 - Accelerated ageing in soya bean seeds produced by cultivars classified into different sieve sizes in two crop seasons

For the same crop and cultivar, mean values followed by different lowercase letters on the bars differ significantly by Tukey's test at a level of 5%. P1(5.5), P2 (6.0), P3 (6.5) – BS 2606 SOYTECH; NS 6700 IPRO; NA 5909 RR; LANÇA 58i60 IPRO P1(6.0), P2 (6.5), P3 (7.0) - BS IRGA 1642 IPRO

Figure 7 - Seedling emergence (%) in soya bean seeds produced by cultivars classified into different sieve sizes in two crop seasons

For the same crop and cultivar, mean values followed by different lowercase letters on the bars differ significantly from each other by Tukey's test at a level of 5%. P1(5.5), P2 (6.0), P3 (6.5) – BS 2606 SOYTECH; NS 6700 IPRO; NA 5909 RR; LANÇA 58i60 IPRO. P1(6.0), P2 (6.5), P3 (7.0) - BS IRGA 1642 IPRO

Figure 8 - Electrical conductivity of soya bean seeds produced from cultivars classified into different sieve sizes in two crop seasons

For the same crop and cultivar, mean values followed by different lowercase letters on the bars differ significantly by Tukey's test at a level of 5%. P1(5.5), P2 (6.0), P3 (6.5) – BS 2606 SOYTECH; NS 6700 IPRO; NA 5909 RR; LANÇA 58i60 IPRO. P1(6.0), P2 (6.5), P3 (7.0) - BS IRGA 1642 IPRO

Considering the classification of soya bean seed vigour based on electrical conductivity, Prado *et al*. (2019) found the following values: very high - for batches with an EC ≤ 70 µS cm^{-1} g^{-1}; high - for batches with an EC of 71 to 90 µS cm^{-1} g^{-1}; medium – for batches with an EC of 91 to 110 µS cm^{-1} g^{-1}; and low – for batches with an EC ≥ 111 µS cm^{-1} g^{-1}, which are not considered viable for sowing.

In general, the majority of soya bean cultivars from S1, S2 and S3 produced seeds that showed no difference in germination or vigour (first count, accelerated ageing, field emergence and electrical conductivity). The results of this study are therefore important to seed companies that produce seeds of this genetic category, as genetic seed is produced on a small scale, in relatively small areas, to allow for rigorous inspection and the elimination of any material that might compromise the genetic purity of the cultivar. If these production areas are set up using either small or large seeds, and the resulting plants are grown in isolation, they will produce quality seeds, as seen in the present study.

CONCLUSION

The seed classification of the soya bean varieties under study had no effect on the germination of the seeds produced in each of the crop seasons. For the NA 5909 RR cultivar, the highest seed vigour in the accelerated ageing and seedling emergence test was seen in the seeds of plants grown from larger seeds (Season 2). For the other cultivars, the size classification of the seeds had no effect on the vigour of the seeds that were produced.

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