STANDARDIZATION OF SEEDS AND IMPLICATIONS ON WHEAT YIELD AND PRODUCTIVITY

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ABSTRACT – There is influence of size of the wheat seeds in the traits of importance agronomic. Thus, this study aimed to determine the effect of the size of wheat seeds in the yield components and grains productivity. The study was carried out in the 2016 harvest. Apllied is the experimental design was a randomized block, organized in factorial design, with three wheat cultivars x six seed lots x five sizes of sieves, the treatments were arranged in three replicates. Were measured characters as grain yield (kg ha^{-1}), mass of thousand seeds (g), hectoliter mass (kg hct-1) and economic analysis obtained through profitability per hectare (R$ ha^{-1}). The size of wheat seeds influences the number of spikelets of the principal plant, number of primary and secondary seed, number of seeds of the principal plant, primary and secondary tillers, productivity, mass of thousand seeds and hectoliter weight. The standardization of wheat seeds provides benefits to the productive yield of wheat plants. The seeds retained in the sieve V (<2.00 mm) resulted in less productive plants; and plants derived from sieve III (2.5 to 2.99 mm) formed plants with higher productivity being 2.3% higher than the original sample. Also, it was 2% higher than the sieve II (> 3,0 mm), 2.7% compared to sieve IV (2.0 to 2.49 mm) and 6% from sieve V (<2.0 mm).

Keywords: production of seeds, science and technology of seeds, technical standards, Triticum aestivum L.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is a grass of the family Poaceae, annual cycle, classified as a basic cereal for human and animal food, this reflects in the high consumption and the need of production. It is of global importance because in 2017 740 million tons of grain were produced (FAO, 2017). At the national level, 57 million tonnes of grains were harvested on 1.9 million hectares, of this amount, the South Region was responsible for 4.6 million tons, with Rio Grande do Sul being the second largest producer with 1.6 million tons of grain (Conab, 2018).

The size of seeds is shown associated with the genetic characteristics of each genotype (Martins et al., 2016), however, these aspects can substantially influence the early development of seedlings, where, probabilistically, larger seeds propitiate plants with superior height and accumulation of biomass (Sangoi et al., 2004) as well, positive response to yield components (Grieve and Francois, 1992). However, these effects may influence the quality and variability of the produced seeds (Favarato et al., 2011).

The wheat genotypes present pronounceable variability in relation to the length, width, thickness, and volumetric density of seeds (Guilherme et al., 2014), this might influence the physiological quality of the used seed and those to be produced (Battisti, et al., 2011). Bredemeier et al. (2001), determined that the size of the wheat seeds potentiates the emission rate of the leaves in the principal plant, but there is a lack of detailed information of this phenomenon in relation to the yield components. Thus, this study aimed to determine the effect of the size of wheat seeds in the yield components and grains productivity.

MATERIAL AND METHODS

The study was carried out in the municipality of Tenente Portela – Rio Grande do Sul - RS in the 2016 harvest, in an environment characterized by altitude of 420 meters, latitude 27°23'31.04 " S and Longitude 53°46'50.71" W. The climate is subtropical humid, type Cfa according to Köppen (Sotério et al., 2005), and the soil is characterized as a typical alumino red ferric.

The seeds were obtained from fields in the northern of Rio Grande do Sul, where the cultivars were

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selected because of their adaptability and productive stability, being: Quartzo (wheat type bread, with hard grain and medium cycle), Ametista (wheat type bread/enhancer, with hard grains, dark red color and medium cycle); TBIO Sinuelo (belonging to the bread type with hard grains and medium to late cycle). These seeds were submitted to classification using a set of sieves.

The experimental design was a randomized block, organized in factorial design, with three wheat cultivars (Quartzo, Ametista and TBIO Sinuelo) x six seed lots (A, B, C, D, E and F) x five sizes of sieves (I: original sample without standardization (AO), II: seeds retained in the sieve > 3,00 mm, III: seeds of 2,5 to 2,99 mm, IV: seeds between 2,0 to 2,49 mm and V: < 2.0 mm), and the treatments were arranged in three replicates. Base and broadcast fertilizing were performed according to the soil analysis (CQFS-RS/SC, 2004). Seeding was carried out in the second half of July 2016, in the population density of 330 viable seeds per square meter. The weed control, pests and diseases were realized preventively. The experimental units consisted of five sowing lines spaced by 0.17 meters and two meters long, with a useful area of 0.51 m² from the two central lines.

The characters measured correspond to the number of main and secondary tillers (units) (where the main tiller was determined by the outstanding one), number of spikelets in the principal plant and the primary and secondary tillers, number of seeds of the main plant, primary and secondary tillers (units), as well as the contribution of tillers and the main plant in the final grains productivity (grams per plant) obtained by randomly collecting ten plants in the utile area. Also, were measured characters as grain yield (kg ha^{-1}) mass of thousand seeds (g) hectoliter mass (kg hct^{-1}) acquired by the seeds of the useful area, and economic analysis obtained through profitability per hectare (R$ ha^{-1}), based on the minimum price of wheat.

The data obtained were submitted to variance analysis at 5% of probability, where the assumptions of the statistical model were verified (Ramalho et al., 2012). Subsequently, it was tested the interaction between wheat cultivars x seed lots x seed size at 5% probability. Characters that revealed significant interaction were unraveled to simple effects for each factor together.

RESULTS AND DISCUSSION

Analysis of variance revealed significance for the interaction between wheat cultivar *x* seed lots *x* size of the seeds, at 5% probability for the number of spikelets per head of the primary tiller, number of spikelets per head in the secondary tiller, number of seeds originating from principal plant, number of seeds of the primary tiller, number of seed from the secondary tiller, thousand seed mass and hectoliter mass. There were interaction of seed lots *x* seed size relative to the number of spikelets per head of the principal plant and tillers mass. Differential effects were obtained between wheat cultivars *x* seed lots for the number of spikelets per head of the principal plant and tillers mass.

The number of spikelets in the principal plant (Table 1) showed no differences between the sieve sizes in lots A, B and C, however, the plants from the sieve II (> 3.0 mm) of lot D, sieve V (<2.0 mm) of lots D and E, AO, resulted in a decrease in the magnitude of spikelets in the principal plant. In face of the lots, the AO did not differ from the other lots, however, the plants from the sieve II (> 3.0 mm), the sieve III (2.5 to 2,99 mm) and the sieve IV (2.0 a 2.49 mm) reduced the number of spikelets of the principal plant in 16% of the lots tested. The variation attributed to the number of spikelets per spike is dependent on the characteristics of the genotype and the conditions in which the growing environment presented at the time of differentiation (Pires et al., 2011), these effects directly affect the magnitude of grain of the head (Vesohoski et al., 2011) and productivity (Muller et al., 2012).

Among cultivars (Table 1), the cultivar Quartzo obtained the number of spikelets per head of the principal plant equal to or greater than the other cultivars. The difference between cultivars is attributed to genetic variability (Vesohoski et al., 2011) and conditions imposed by the environment (Santos et al., 2012; Szareski et al., 2017; Szareski et al., 2018).

The number of spikelets of the primary tiller (Table 2) revealed that the Ametista cultivar with seeds from the AO presented lower magnitude expressed in lots B, C and F, for plants which seeds passed by sieve II (> 3.0 mm) in lots A and D, V and sieved (<2.0 mm) of lot E.

For the cultivar Quartzo, the AO presented smaller number of spikelets in lot F, as well as, the plants of the sieve II (> 3.0 mm) in lot D, sieve III (2.5 to 2, 99 mm) in lot A and sieve V (<2,0 mm) of lots B and E. In the TBIO Sinuelo the AO presented smaller number of spikelets in the primary tiller in lot D and F, as well as, the IV sieve (2.0 to 2.49 mm) of lots C and E, and V sieve (<2.0 mm) of lot E presented lower magnitude. In general, the non-standardization represented by the AO and seeds of larger and smaller size presented smaller number of spikelets per ear of the primary tiller. Fertile tillers are related to increased seed production, mainly, when sooner the formation of the spike, the greater the number of primordial leaves that accumulate in the apical meristem that formed spikelets (Muller et al., 2012).

Table 1 - Means for the interaction sieve size x lots x genotypes for number of spikelets/head of the principal plant

SS**	Number of spikelets/Head of the principal plant.											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	15,46	aA	15,39	aA	15,74	aA	15,12	abA	15,65	abA	15,47	bA
II (>3,0 mm)	15,46	aB	15,94	aA	15,63	aA	14,91	bB	16,06	aA	16,14	aA
III (2,5 a 2,99mm)	14,94	aB	15,25	aAB	15,28	aAB	15,34	abAB	15,83	abA	15,85	abA
IV (2,0 a 2,49mm)	15,14	aB	15,96	aA	15,58	aAB	15,68	aA	15,63	abA	15,52	bA
V (< 2,0 mm)	15,56	aAB	15,37	aB	15,9	aAB	15.00	bB	15,18	bB	16,17	aA
Cultivar	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
Ametista	14,59	b	15.00	b	14,77	b	14,59	b	15,63	ab	15,45	b
Quartzo	15,52	ab	15,95	a	15,8	a	15,78	a	16,03	a	16,22	a
TBIO Sinuelo	15,83	a	15,8	a	16,31	a	15,25	c	15,35	b	15,81	a
CV (%)	14,30											

*Means followed by the same lowercase letter in column, same uppercase letter in line do not differ statistically from Tukey test at 5% probability of error.

**SS Sieve Size.

***AO Original Sample of lot without size fractioning.

Between lots (Table 2), for the cultivar Ametista, the plants coming from the AO had a smaller number of spikelets/heads of the primary tiller in 83% of the lots, as well as the sieve II (> 3.0 mm) 16%, sieve III (2.5 to 2, 99 mm) in 33 %. For the cultivar Quartzo, the sieves II (> 3.0 mm) and IV (2.0 to 2.49 mm) did not differ, but the AO and sieve II (> 3.0 mm) presented magnitude lower in 16% of the lots, as well as the sieve in 33% of the lots tested. In the TBIO Sinuelo the AO presented a reduction in 50% of the evaluated lots, as well as the sieve III (2.5 to 2,99 mm) and V (<2,0 mm) in 16%, sieve IV (2.0 to 2.49 mm) 66%. These results show the importance of the standardization of wheat seeds because, independent of the lot evaluated, there is a differential response between standardized seeds in the sieves of different holes (Muller et al., 2012).

Among cultivars, when there was a significant difference, the cultivar Quartzo obtained a magnitude equal to or greater than the others in all the sieves used for the standardization and lots evaluated (Table 2). Among wheat cultivars there is variability, with a tendency of plants with lower number of number of tillers to produce larger number of spikelets (Motzo et al., 2004).

Table 2 - Means for the interaction genotypes x seeds size x lots for the variable number of spikelets in the primary tiller

SS**	Number of spikelets in the primary tiller											
	Ametista											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	13,46	aBα	11,10	bBα	10,76	bBβ	12,93	abBαβ	17,20	aAα	10,83	bBα
II (>3,0 mm)	9,66	bCβ	13,60	abABα	13,93	aAα	11,85	bBCα	14,96	abAα	13,16	abABα
III (2,5 a 2,99mm)	12,45	abBα	13,76	abABα	12,46	abBα	15,63	aAα	14,90	abABα	13,63	abABα
IV (2,0 a 2,49mm)	12,20	abAα	14,83	aAα	12,64	abAαβ	13,37	abAα	12,46	bcAαβ	13,03	abAα
V (< 2,0 mm)	12,55	abAβ	13.00	abAα	13,56	abAα	14,40	abAα	11,63	cAα	14,23	aAα

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Table 2 - Cont.

SS**	Quartzo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	13,46	abABα	13,32	abABα	14,83	aAα	15,16	aAα	14,76	abAα	10,65	bBα
II (>3,0 mm)	12,36	bAαβ	14,60	aAα	12,75	aAα	11,70	bAα	14,31	abAα	14,03	aAα
III (2,5 a 2,99mm)	9,09	cBβ	12,69	abAα	13,43	aAα	13,80	abAα	14,90	abAα	13,96	aAα
IV (2,0 a 2,49mm)	14,30	abAα	15,13	aAα	14,20	aAα	12,96	abAα	15,24	aAα	14,63	aAα
V (< 2,0 mm)	15,93	aAα	11,54	bCα	12,50	aBCα	12,86	abBCα	12,03	bCα	15,16	aABα
SS**	TBIO Sinuelo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	12,46	aABα	11,14	aBα	14,3	aAα	11,24	bBβ	14,31	aAα	10,60	bBα
II (>3,0 mm)	12,83	aAα	13,96	aAα	15.00	aAα	13,26	abAα	14,73	aAα	14,93	aAα
III (2,5 a 2,99mm)	14,95	aAα	11,80	aBα	13,86	abABα	14,70	aABα	12.00	abABα	13,20	aABα
IV (2,0 a 2,49mm)	12,12	aBα	11,90	aBβ	11,06	bBβ	15,73	aAα	11,24	bBβ	13,20	aABα
V (< 2,0 mm)	13,37	aAαβ	12,09	aABα	14,83	aAα	13.00	abABα	10,16	bBα	12,63	abABα
CV (%)	44,46											

* Means followed by the same lowercase letter in column for sieve size, same uppercase letter in line for sieve size between lots and same greek letter between genotypes do not differ statistically from Tukey testa t 5% probability of error.

**SS Sieve Size.

***AO Original Sample of lot without size fractioning.

The number of spikelets/head of secondary tiller (Table 3) between seed sizes, for the cultivar Ametista, the standardization did not differ in lots A, C, and F, however, non-standardization obtained by the AO of the lot B showed lower magnitude, as well as the plants from the seeds retained in the IV sieve (2.0 to 2.49 mm) of lot E, and sieve V (<2.0 mm) from lot E. For the cultivar Quartzo, lots B and E did not differ, however, from the AO, sieve II (> 3.0 mm) and III (2.5 to 2,99 mm) from lot A, sieves II (> 3.0 mm), IV (2.0 to 2.49 mm) and V (<2.0 mm) of lot D, and AO of lot F presented lower magnitude.

For the TBIO Sinuelo, lot B did not differ in the standardization of the seeds, however, the plants obtained from the non-standardization by the AO of lot A presented lower magnitude. The same occurred for the seeds retained in the IV sieve (2, 0 to 2.49 mm) from lot C, AO and V (<2,0 mm) sieve from lot C, sieve III (2.5 to 2,99 mm), IV (2.0 a 2.39 mm) and V (<2.0 mm) from lot E, as well as the sieve V (<2.0 mm) from lot F. The difference in response to the number of spikelets of the secondary tiller can be attributed to the number of tillers produced by each plant, since wheat cultivars with high tillering potential have the ability to modify and compensate for the lack of a yield component, depending on the cultivar and environment, which are controlled by phytochrome and hormonal relationships (Valério et al., 2009).

Between lots (Table 3) for the genotype Ametista, the sieve IV (2.0 to 2.4 mm 9) resulted in plants with the same number of spikelets of the secondary tiller for all lots. However, the AO and the sieve III (2.5 to 2.99 mm) showed plants with reduced number of spikelets in the secondary tiller in 33% of the lots evaluated, same for the sieve II (> 3.0 mm) and V (<2.0 mm) at 16% of the lots.

For the cultivar Quartzo, the plants from the sieve II (> 3.0 mm) presented the same number of spikelets per head of the secondary litter in all lots evaluated. However, the AO had magnitude lower than 33% of the lots, as well as the sieve III (2.5 to 2.99 mm) and IV (2.0 to 2.49 mm) in 16% lots, and the V sieve (<2.0 mm) in 66% of the lots evaluated.

For TBIO Sinuelo, the plants from the seeds retained in the sieve III (2.5 to 2,99 mm) presented the same number of seeds, however, the AO without standardization and the V sieve (<2,0 mm) showed a magnitude inferior in 66% of the evaluated lots, as well as the plants from the sieve II (> 3.0 mm) in 50% of the lots.

Among cultivars, plants from the seeds retained in the sieve V (<2.0 mm) in lot A of the cultivars Ametista and TBIO Sinuelo showed lower number of spikelets of the secondary tiller. The cultivar TBIO Sinuelo, in lots D and F, showed lower magnitude than cultivar Quartzo. The number of seeds per spikelet is defined in the differentiation of flowers in the spikelet, where it initiates the development of male and female organs (Nakagawa, 2014) and has a positive relation with productive potential (Vesohoski et al., 2011, Carvalho et al., 2017).

Table 3 - Means for the interaction genotypes x seeds size x lots for the variable number of spikelets in the secondary tiller

Number of spikelets in the secondary tiller.												
TP**	Ametista											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	6,26	aBα	5,63	bBβ	8,5	aABα	11,03	abAαβ	10,9	abAα	8,06	aABα
II (>3,0 mm)	4,86	aBα	9	abAα	10,36	aAα	9,71	abAα	12,73	aAα	9,7	aAα
III (2,5 a 2,99mm)	7,9	aBα	10,3	aABα	8,5	aBα	13,36	aAα	11,7	abABα	9,73	aABα
IV (2,0 a 2,49mm)	7,93	aAα	11,2	aAα	8,97	aAαβ	7,89	bAαβ	9,03	abAαβ	8,96	aAα
V (< 2,0 mm)	8,62	aABαβ	10,14	aABα	11,86	aAα	10,96	abABα	7,93	bBα	11,19	aABα
TP**	Quartzo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	7,56	bBCα	10,45	aABα	11,6	aAα	11,76	aAα	9,46	aABα	5,36	bCα
II (>3,0 mm)	7,13	bAα	10,1	aAα	7,55	bAα	6,7	bAα	10,33	aAα	9,2	abAα
III (2,5 a 2,99mm)	5,81	bBα	7,06	aABα	8,23	abABα	8,56	abABβ	11,03	aAα	7,4	abABα
IV (2,0 a 2,49mm)	8,8	abABα	10,03	aAα	10,66	abAα	5,6	bBβ	10,65	aAα	9,06	abABα
V (< 2,0 mm)	12,46	aAα	7,64	aBα	8,21	abBα	7,53	bBαβ	7,7	aBα	10,73	aABα
TP**	TBIO Sinuelo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	4,62	bCα	7,76	aBCαβ	9,3	aABα	7,51	bBCβ	11,73	aAα	5,79	abBCα
II (>3,0 mm)	7,83	abBα	7,63	aBα	10,28	aABα	7,83	abBα	11,9	aAα	9,63	aABα
III (2,5 a 2,99mm)	9	aAα	6,93	aAα	10,66	aAα	10,03	abAαβ	6,93	bAβ	9,76	aAα
IV (2,0 a 2,49mm)	8,61	aABα	7,33	aBα	4,9	bBβ	11,66	aAα	6,65	bBβ	7,65	abBα
V (< 2,0 mm)	7,28	abBβ	7,09	aBα	11,66	aAα	6,71	bBβ	5,16	bBα	5,66	bBβ
CV (%)	87,38											

* Means followed by the same lowercase letter in column for sieve size, same uppercase letter in line for sieve size between lots and same greek letter between genotypes do not differ statistically from Tukey testa t 5% probability of error.

**SS Sieve Size.

***AO Original Sample of lot without size fractioning.

As for the number of seeds in the principal plant (Table 4), the seed size standardization for the Ametista cultivar, the lots B, C and D, the plants from the AO without the standardization presented equal or lesser number of seeds of the main plant when compared to the standardization of the seeds.

For the cultivar Quartzo the plants originating from the original sample, from seeds held in sieve III (2.5 to 2,99 mm) of lots A and B, and of sieve V (<2.0 mm) of lot E presented lower seed number in the principal plant. In the TBIO Sinuelo cultivar, the AO in lot B resulted in plants with lower seed number in the main plant, as well as plants formed from seeds retained in sieve II (> 3.0 mm) from plot C and sieve IV (2.0 to 2.49 mm) from plot A. Seeds from the principal plant contribute to the mass of the heads and do not interfere in the mass of thousand seeds (Carvalho et al., 2017).

Among the lots, for the cultivar Ametista, 66% of the lots presented lower number of seeds in the principal plant when obtained from the AO, as well from the sieve II (> 3,0 mm) and III (2.5 to 2,99 mm), with 33% of the lots evaluated (Table 4). In the cultivar Quartzo, the sieve II (> 3.0 mm) resulted in plants with the lowest number of seeds in the main plant in 66% of the lots. As well, 50% of the plots of the plants coming from the sieve III (2.5 to 2.99 mm), and in 16% of the lots for the IV (2.0 to 2.49 mm) and V (<2.0 mm) sieves presented lower number of seeds.

In the TBIO Sinuelo, the plants from seeds retained in the sieve IV (2.0 to 2.49 mm) did not differ. However, the plants produced by the seeds from the AO and sieve III (2.5 to 2.99 mm) had fewer seeds of the principal plant in 16% of the lots, as well as those seeds retained in (> 3.0 mm) and V (<2.0 mm), which in 33% of the lots presented lower seeds in the principal plant.

Among cultivars, it is observed that the cultivar TBIO Sinuelo presented equal or greater number of seeds than the other cultivars (Table 4). The number of seeds of the main plant contributes significantly to the production, and cultivars that present this characteristic tend to have higher productivity (Carvalho et al., 2017).

Table 4 - Means for the interaction genotypes x seeds size x lots for the variable number of seeds in the principal plant

	Number of seeds in the principal plant											
TP**	Ametista											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	31,90	aBα	27,07	bCβ	29,76	bBCβ	31,00	bBCα	34,26	aABα	35,23	aAα
II (>3,0 mm)	29,56	aCΓ	33,67	aABCβ	34,36	aABα	33,1	abBCα	35	aABα	37,36	aAα
III (2,5 a 2,99mm)	31,70	aBαβ	32,20	abABβ	31,36	abBβ	34,75	abABα	35,16	aABα	35,92	aAα
IV (2,0 a 2,49mm)	33,63	aAα	32,96	aAα	33,6	abAαβ	36,82	aAα	35,06	aAα	33,96	aAα
V (< 2,0 mm)	32,47	aAα	34,93	aAα	35,23	aAα	34,6	abAα	33,03	aAα	36,38	aAα
TP**	Quartzo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	32,90	abAα	34,24	bAα	35	aAα	33,76	aAα	35,7	abAα	31,74	bAα
II (>3,0 mm)	34,43	abBβ	38,93	aAα	32,44	aBα	32,07	aBα	35,46	abABα	34,6	abBα
III (2,5 a 2,99mm)	30,86	bBCβ	29,37	cCβ	31,73	aBCβ	33,6	aABα	37,03	Aaα	34,7	abABα
IV (2,0 a 2,49mm)	33,5	abABα	34,6	bABα	31,5	aBβ	35,53	aABα	34,75	abABα	36,9	aAα
V (< 2,0 mm)	36,65	aABα	33,77	bABα	33,96	aABα	34,76	aABα	32,6	bBα	37,63	aAα
TP**	TBIO Sinuelo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	35,23	abABα	31,41	bBα	36,6	abAα	32,65	aABα	34,19	aABα	33,06	aABα
II (>3,0 mm)	38,86	aAα	35,83	abAαβ	33,24	bBα	33,4	aBα	35,93	aABα	35,5	aABα
III (2,5 a 2,99mm)	35,56	abABα	37,33	aAα	35,56	abABα	35,36	aABα	33,03	aBα	35,26	aABα
IV (2,0 a 2,49mm)	32,59	bAα	34,63	abAα	35,90	abAα	35,83	aAα	34,77	aAα	36,16	aAα
V (< 2,0 mm)	34,63	abABα	33,39	abBα	37,8	aAα	33,5	aBα	34,96	aABα	35,17	aABα
CV(%)	10,56											

* Means followed by the same lowercase letter in column for sieve size, same uppercase letter in line for sieve size between lots and same greek letter between genotypes do not differ statistically from Tukey testa t 5% probability of error.

**SS Sieve Size.

***AO Original Sample of lot without size fractioning.

The number of seeds from tiller 1 (Table 5) for the cultivar Ametista, when the plants were derived from the AO, had fewer seeds in lots B, C and F as well as the rice plants of retained seed in the sieve II (> 3.0 mm) of lot A and in the sieve V (<2.0 mm) of lot E. In the Quartzo cultivar, the AO of lot F presented lower number of seeds, the plants from the seeds retained in sieve III (2.5 to 2,99 mm) of lot A, and sieve V (<2,0 mm) from lots B and E.

For the cultivar TBIO Sinuelo, the AO of lots D and F had a smaller number of seeds in the tiller, as well as those of the sieves IV (2,0 to 2,49 mm) and V (<2,0 mm) of lot E. The number of seeds from tillers has direct effect with low correlation to wheat yield (Carvalho et al., 2017).

Among the lots (Table 5), for the cultivar Ametista, the plants originated from the AO achieved 50%

of lots with fewer seeds of tiller 1, and 16% of the evaluated lots, for the plants from seeds of sieves II (> 3.0 mm), III (2.5 to 2.99 mm) and IV (2.0 to 2.49 mm).

In the genotype Quartzo, plants from the AO, sieves II (> 3.0 mm) and III (2.5 to 2.99 mm) showed, in 16% of the evaluated lots, fewer seeds in tiller 1, as well as the plants from the V sieve (<2,0 mm) in 50% of the evaluated lots.

TBIO Sinuelo, the AO without the standardization and the plants from the sieves IV (2.0 to 2.49 mm) and V (<2.0 mm), showed reduction in the number of seeds of the primary tiller in 50% of the lots, as well as in 33% of the lots, for the plants coming from the seeds retained in the sieve III (2.5 to 2,99 mm).

When comparing the cultivars (Table 5), despite the variation between the standardization and the evaluated lots, there is little difference in the number of seed of primary tiller among the cultivars evaluated.

For the number of seeds from the secondary tiller in the cultivar Ametista (Table 6), the plants originated from the AO of the lots B and C, presented smaller number of seeds, as well as those originated from seeds retained in the sieve III (2.5 to 2.99 mm) from lot A, sieve IV (2.0 to 2.49 mm) from lot C and sieve V (<2.0 mm) from lot E (Table 6). In the cultivar Quartzo, the seeds from the sieve V (<2.0 mm) produced plants with higher number of seeds in the secondary tiller of lot A. No. However, in lot D and E propitiated fewer seeds. In TBIO Sinuelo, the original non-standardized sample had lower number of seeds in lot F, as well as sieve IV (2.0 to 2.49 mm) of lots C and E, and sieve V (<2.0 mm) of the lots D, E, F. The number of seeds is influenced by tillering, nutrients and characteristic of each genotype (Carvalho et al., 2017).

Table 5 - Means for the interaction genotypes x seeds size x lots for the variable number of seeds in primary tiller

Number of seeds in primary tiller.												
TP**	Ametista											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	27,70	aABα	19,71	bCβ	20,10	bBCα	27,00	aABα	28,4	abAα	21,22	bBCα
II (>3,0 mm)	20,60	bBα	26,74	aABα	27,03	aABα	23,63	aABα	30,29	abAα	28,46	aAα
III (2,5 a 2,99mm)	23,91	abBαβ	28,06	aABα	25,13	abABα	25,83	aABα	31,23	aAα	29,30	Aabα
IV (2,0 a 2,49mm)	25,20	abAα	26,86	aAα	23,99	abABβ	28,06	aAαβ	25,70	abAαβ	27,13	abAα
V (< 2,0 mm)	26,13	abAβ	26,92	aAα	27,93	aAα	26,83	aAαβ	23,66	bAα	29,5	aAα
TP**	Quartzo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	25,5	bABα	27,77	abAα	26,53	aAα	27,93	aAα	28,03	abAα	19,39	bBα
II (>3,0 mm)	23,53	bcABα	30,06	aAα	27,03	aABα	23,01	aBα	27,56	abABα	26,36	abAα
III (2,5 a 2,99mm)	17,74	cBβ	24,94	abAα	24,70	aAα	26,23	aAα	30,73	aAα	25,33	abAα
IV (2,0 a 2,49mm)	28,16	bAα	30,86	aAα	31,20	aAα	26,83	aAβ	30,41	aAα	29,20	aAα
V (< 2,0 mm)	35,68	aAα	21,97	aAα	25,12	aBCα	24,76	aBCβ	23,36	bCα	30,26	aABα
TP**	TBIO Sinuelo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	22,7	aABα	21,01	aBαβ	25,23	aABα	21,51	cBα	28,73	aAα	21,74	bBα
II (>3,0 mm)	25,6	aAα	25,80	aAα	28,29	aAα	26,86	bcAα	27,86	aAα	31,23	aAα
III (2,5 a 2,99mm)	28,96	aABα	23,96	aBα	27,66	aABα	31,90	abAα	22,80	abBα	28,46	abABα
IV (2,0 a 2,49mm)	23,91	aBα	24,93	aBα	22,03	aBβ	34,06	aAα	21,16	bBβ	27,6	abABα
V (< 2,0 mm)	23,91	aBCβ	23	aBCα	28,8	aABα	32,05	aAα	18,50	bCα	25,03	abABCα
CV (%)	51,36											

* Means followed by the same lowercase letter in column for sieve size, same uppercase letter in line for sieve size between lots and same greek letter between genotypes do not differ statistically from Tukey testa t 5% probability of error.
**SS Sieve Size.
***AO Original Sample of lot without size fractioning.

Between lots, the cultivar Ametista, in the AO, the plants from the seeds of the sieves II (> 3.0 mm) and V (<2.0 mm) produced fewer seeds in the secondary tiller in 33% of the lots evaluated, as well as the sieve III (2.5 to 2,99 mm) in 16% of the evaluated lots. However, it is observed that the IV sieve (2.0 to 2.49 mm) exhibited similarity in all evaluated lots not statistically differing in the number of seeds (Table 6). In the Quartzo cultivar, the sieve II (> 3.0 mm) showed the same number of seeds of the secondary tiller, however, the other sieves and the AO provided fewer seeds number in 16% of the evaluated lots.

For the TBIO Sinuelo, the sieve III (2.5 to 2,99 mm) did not differ between the evaluated lots, however, the AO and the IV sieve (2.0 to 2.49 mm) propitiated lower number of seeds of the secondary tiller in 33% of the lots, as well as the sieve II (> 3.0 mm) in 16%, and the sieve V (<2,0 mm) in 50% of the lots. Wheat plants with a high number of tillers tend to increase the mass and number of grains, and they have an indirect effect on increasing productivity (Carvalho et al., 2017). Among cultivars, the Ametista showed a greater or equal number of seeds of the secondary tiller.

Table 6 - Means for the interaction genotypes x seeds size x lots for the variable number of seeds in the secondary tiller

	Number of seeds in the secondary tiller.											
TP**	Ametista											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	11.73	abCα	12.26	bBCα	16.60	bABCα	20.09	aABαβ	21	abcAα	17.49	aABCα
II (>3,0 mm)	8.90	bCα	14.76	abBCα	19.94	abABα	19.73	aABα	25.73	aAα	21.09	aABα
III (2,5 a 2,99mm)	14.47	abBα	18.80	abABα	17.76	abABα	20.13	aABα	23.33	abAα	20.56	aABα
IV (2,0 a 2,49mm)	16.83	abAα	20.23	aAα	16.08	bAαβ	16.88	aAαβ	17.30	bcAαβ	19.4	aAα
V (< 2,0 mm)	17.33	aBβ	21.23	aABα	25.56	aAα	22.76	aABα	15.61	cBα	20.98	aABα
TP**	Quartzo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	16.23	bABα	20.09	aAα	21.83	aAα	22.16	aAα	19.43	abAα	10.84	aBα
II (>3,0 mm)	14.30	bAα	19.08	aAα	14.08	aAα	14.79	abAα	21.80	aAα	17.33	aAα
III (2,5 a 2,99mm)	11.73	bBα	13.95	aABα	16.83	aABα	16.8	abABα	21.9	aAα	14.7	aABα
IV (2,0 a 2,49mm)	16.93	bABα	20.86	aAα	21.6	aAα	10.76	bBβ	22.3	aAα	16.16	aABα
V (< 2,0 mm)	28.87	aAα	15.62	aBCα	16.94	aBCβ	11.29	bCβ	13.83	bBCα	20.1	aBα
TP**	TBIO Sinuelo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	10.0	aBα	12.92	aABα	17.73	aABα	14.06	abABβ	20.54	abAα	10.12	bBα
II (>3,0 mm)	15.7	aABα	14.36	aBα	19.3	aABα	15.43	abABα	22.77	aAα	19.98	aABα
III (2,5 a 2,99mm)	17.63	aAα	13.26	aAα	21.16	aAα	19.53	abAα	13.50	bcAβ	20.3	aAα
IV (2,0 a 2,49mm)	16.04	aABα	14.46	aABα	8.92	bBβ	22.00	aAα	9.52	cBβ	14.7	abABα
V (< 2,0 mm)	14.93	aABβ	14.6	aABα	22	aAαβ	12.26	bBβ	8.56	cBα	11.13	bBβ
CV (%)	91.51											

* Means followed by the same lowercase letter in column for sieve size, same uppercase letter in line for sieve size between lots and same greek letter between genotypes do not differ statistically from Tukey testa t 5% probability of error.

**SS Sieve Size.

***AO Original Sample of lot without size fractioning.

By standardizing seeds, it was influenced the contribution of the principal plant productivity and tillers. The average principal plant weight did not differ between evaluated lots, however, in plants coming from the AO not standardized, showed less weight for principal plant and tillers. Also, the tillers were showed higher productivity when compared to the principal plant (Table 7, Figure 1a). The mass of tassels has a low and positive indirect effect on wheat grain yield, as well as the principal plant heads mass has direct positive effects (Carvalho et al., 2017).

Table 7 - Means for genotypes, seeds size and lots for the mass of principal plant

TP**	Mass of principal plant (g)
I (AO)***	1.07 b
II (>3,0 mm)	1.13 a
III (2,5 a 2,99mm)	1.09 ab
IV (2,0 a 2,49mm)	1.09 ab
V (< 2,0 mm)	1.10 ab
Genótipo	Mass of principal plant (g)
Ametista	1.12 a
Quartzo	1.07 b
TBIO Sinuelo	1.10 ab
Lots	Mass of principal plant (g)
A	1.08 a
B	1.09 a
C	1.09 a
D	1.11 a
E	1.09 a
F	1.12 a
CV (%)	32.41

*Means followed by the same lowercase letter in column do not differ statistically from Tukey testa t 5% probability of error.

**SS Sieve Size. **AO Original Sample of lot without size fractioning.

Among cultivars, the cultivar Ametista obtained the largest weight of the main plant and higher contribution of tiller in productivity when compared to other cultivars (Table 8, Figure 1a). The response of seed standardization to the mean contribution of the tillers weight, in lots B and F, to the plants from the AO without the standardization, produced less weight of the tillers when compared to standardization (Table 8).

The average productivity of the plants obtained in sieve III (2.5 to 2.99 mm) produced 163.20 kg more than the non-standard AO, presenting a profit difference per hectare of R$ 103,36, as well as 427.50 kg less than the plants from the V sieve (<2.0 mm), providing a difference of R $ 270.75 in relation to the non-standardization of the seeds (Table 9, Figure 2). The wheat crop is able to maintain production in a large range of sowing density, as it has phenotypic plasticity, determined by the number of plants per area, number of fertile tiller, number of grains per head and grain mass (Lopes & Lima, 2015).

Between lots a difference of productivity occurred in lots B and F, of 991.70 kg/ha. Among cultivars, TBIO Sinuelo was superior (Table 9, Figure 2).

Table 8 - Means for the interaction lots x seeds size and geotypes x lots, for the variable weight of tillers

TP**	Weight of tillers											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	1.42	aB	1.53	Bb	1.79	aAB	1.92	aA	2.11	aA	1.41	bB
II (>3,0 mm)	1.53	aB	1.80	abB	1.80	aB	1.68	aB	2.45	aA	2.16	aA
III (2,5 a 2,99mm)	1.47	aB	1.75	abB	1.94	aA	1.83	aB	2.4	aA	2.15	aA
IV (2,0 a 2,49mm)	1.82	aA	2.07	aA	1.67	aA	1.90	aA	1.74	bA	1.85	abA
V (< 2,0 mm)	1.75	aAB	1.73	abAB	2.04	aA	1.66	aAB	1.51	bB	1.78	abAB

Conitnua...

Table 8 - Cont.

Genotype	Weight of tillers											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
Ametista	1.70	aC	1.78	aC	1.98	aBC	1.96	aBC	2.36	aA	2.26	aAB
Quartzo	1.66	aB	1.99	aA	1.71	aB	1.54	bB	2.15	aA	1.64	bB
TBIO Sinuelo	1.44	aB	1.56	aA	1.86	aA	1.90	aA	1.62	bA	1.72	bA
CV(%)						84.82						

* Means followed by the same lowercase letter in column and same uppercase letter in line do not differ statistically from Tukey test at 5% probability of error.
**SS Sieve Size.
***AO Original Sample of lot without size fractioning.

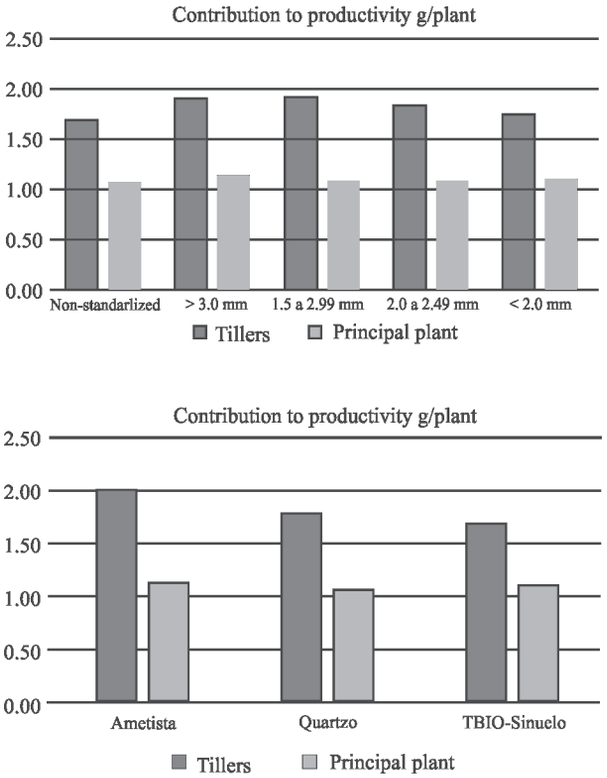

Figure 1 - Contribution for productivity (g plant^{-1}). 1A: Average between sieve of the tillers contribution and female genitor plant in productivity.

Table 9 - Means for seeds size, genotypes and lots, for the variable grain yield

TP**	Yield kg/ha	
I (AO)***	6972.40	a
II (>3,0 mm)	6998.40	a
III (2,5 a 2,99mm)	7135.90	a
IV (2,0 a 2,49mm)	6942.50	a
V (< 2,0 mm)	6708.40	a
Lot	**Yield kg/ha**	
A	7217.70	ab
B	7520.70	a
C	6867.30	ab
D	6864.10	ab
E	6706.30	ab
F	6529.50	b
Genotype	**Yield kg/ha**	
Ametista	6976.90	ab
Quartzo	6606.90	b
TBIO Sinuelo	7269.00	a
CV(%)	19.48	

*Means followed by the same lowercase letter in column do not differ statistically from Tukey test at 5% probability of error.
**SS Sieve Size.
***AO Original Sample of lot without size fractioning.

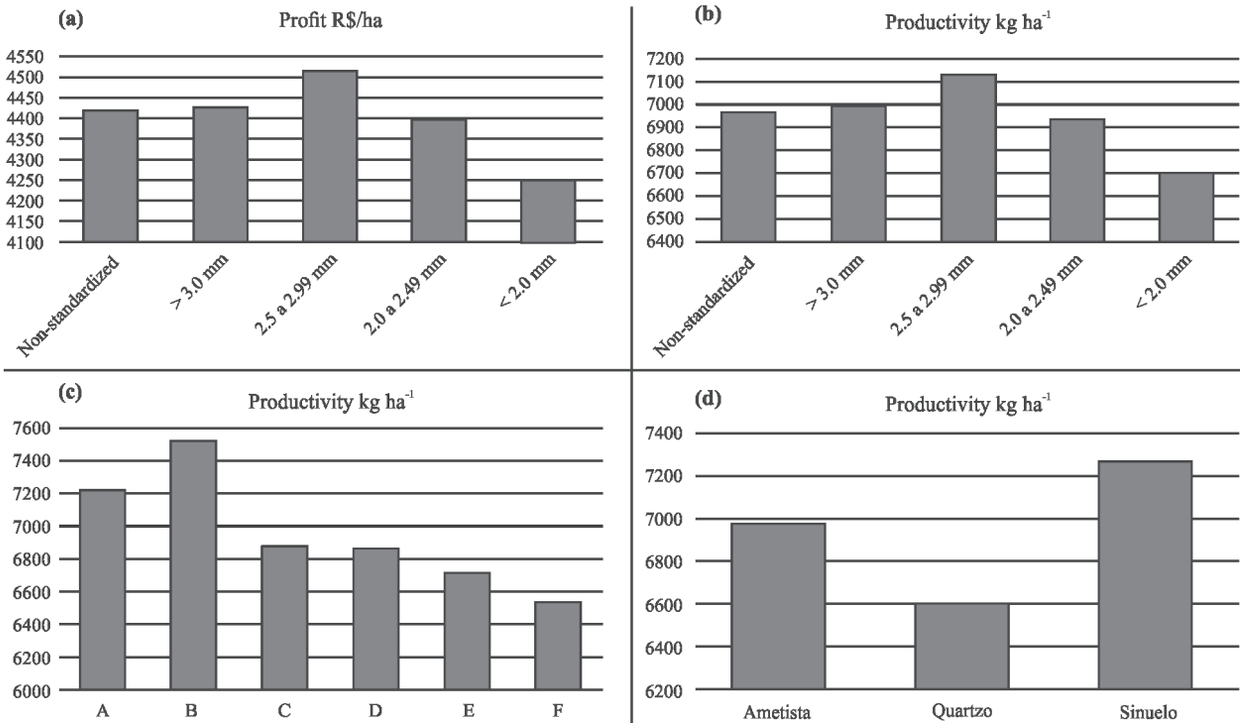

Figure 2 - a) Average productivity among lots; b) Average productivity between cultivars; c) Profit per hectare between sieve sizes based on the wheat price of R$ 38,00; d) Productivity between sieve sizes.

The mass of thousand seeds varied according to the standardization of the seeds. For the cultivar Ametista, lots C and D did not differ in the standardization of the seeds, however, the plants originated from the AO had less than or equal mass of a thousand seeds to those of lot E. As well, those seeds from sieves III (2.5 to 2.99 mm) of the lots A and E; IV (2.0 to 2.49 mm) of lots A and B; and sieve V (<2.0 mm) of the lots E and F (Table 10).

In the cultivar Quartzo, the plants from seeds of sieve II (> 3.0 mm) of the lots A and E, III (2.5 to 2.99 mm) of the lots C, D and F; and IV (2.0 to 2.49 mm) of lot B showed higher thousand seed mass. In cultivar TBIO Sinuelo, the AO, the rice plants of seed lots B and C had lower weight of one thousand seeds, as well of the sieves II (> 3.0 mm) lot E; and sieve V (<2.0 mm) from lots D and F.

Among lots, in the cultivar Ametista and for the AO, 66% of the lots presented reduction in the mass of one thousand seeds, as the sieves II (> 3.0 mm), IV (2.0 to 2.49 mm) and V (< 0 mm) in 16% of lots (Table 10). In the Quartzo cultivar, the AO presented a reduction in the mass of thousand seeds to 16% of the lots, as well as the sieves II (> 3.0 mm) and IV (2.0 to 2.49 mm) in 33% of the lots and the sieve III (2.5 to 2,99 mm) in 66% of the lots evaluated. In the cultivar TBIO Sinuelo, the AO, sieves IV (2.0 to 2.49 mm) and V (<2.0 mm) showed a reduction in 16% of the evaluated lots, as the sieve II (> 3.0 mm) in 33% of the evaluated lots. Among cultivars, in general, TBIO Sinuelo presented mass of thousand seeds less than or equal to the other cultivars.

In hectoliter weight, the difference occurred in only some lots. For the cultivar Ametista, plants from seeds of the sieve III (2.5 to 2,99 mm) provided higher magnitude in lot C (Table 11). In the cultivar Quartzo, plants of the IV sieve (2.0 to 2.49 mm) obtained lower hectoliter weight in lot E. For the cultivar TBIO Sinuelo, the plants from the sieve II (> 3.0 mm) of lot E and seed of sieve V (<2,0 mm) of lot D showed lower hectoliter weight.

Seeds with higher hectolitre tend to have higher grain yields (Silva et al., 2006) and physiological quality (Battisti et al., 2011).

Table 10 - Means for the interaction genotypes x seeds size x lots for the variable Thousand seeds mass

TP**	Ametista											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	39,9	aAα	38,1	aBα	38,1	aBα	37,7	aBα	37,3	bBα	38,9	aABα
II (>3,0 mm)	39,3	abAβ	39,3	aAα	38,8	aABαβ	37,5	aBαβ	38,2	abABβ	39,5	aAα
III (2,5 a 2,99mm)	37,4	cBα	39,0	aAα	38,8	aAαβ	38,3	aAα	37,7	bAαβ	38,8	abAβ
IV (2,0 a 2,49mm)	37,3	cBCα	36,1	bCβ	39,3	aAα	37,9	aABα	39,5	aAα	37,2	bcBCαβ
V (< 2,0 mm)	38,0	bcABαβ	38,9	aAα	38,0	aABα	38,3	aABα	37,3	bABα	37,0	cBαβ
TP**	Quartzo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	38,4	bAαβ	38,2	abABα	38	bABα	36,5	bBCα	37,6	bABα	35,4	cCβ
II (>3,0 mm)	42,2	aAα	38,9	abBα	39,1	bBα	35,9	bCβ	40,5	aBα	37,2	bCβ
III (2,5 a 2,99mm)	38,0	bBα	37,6	bBαβ	42,3	aAα	38,3	aBα	38,1	bBα	40,8	aAα
IV (2,0 a 2,49mm)	33,6	cCβ	39,5	aAα	38,9	bABαβ	37,0	abBα	37,2	bBβ	38,0	bABα
V (< 2,0 mm)	38,6	bAα	37,9	abAα	38,5	bAα	37,0	abAα	38,0	bAα	37,5	bAα
TP**	TBIO Sinuelo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	37,1	aAβ	34,5	cCβ	35,1	bBCβ	36,4	abABα	37,3	abAα	37,1	aAα
II (>3,0 mm)	35,6	aBΓ	38,5	aAα	37,5	aAβ	37,8	aAα	34,7	cBΓ	37,3	aABβ
III (2,5 a 2,99mm)	37,0	aAα	36,7	bAβ	37,7	aAβ	37,4	aAα	36,1	bcAβ	36,2	abAΓ
IV (2,0 a 2,49mm)	36,7	aABα	37,0	abABβ	37,5	aAβ	37,4	aAα	37,1	abABβ	35,6	abBβ
V (< 2,0 mm)	36,3	aBCβ	36,2	bBCβ	36,9	aABα	35,1	bCβ	38,4	aAα	35,5	bBCβ
CV (%)	5.63											

* Means followed by the same lowercase letter in column for sieve size, same uppercase letter in line for sieve size between lots and same greek letter between genotypes do not differ statistically from Tukey test T 5% probability of error.

**SS Sieve Size.

***AO Original Sample of lot without size fractioning.

Among the lots, in the cultivar Ametista the plants originated by seeds of the sieve II (> 3.0 mm) showed a reduction of the hectoliter weight in 16% of the lots, as well in 66% of the lots for seeds of sieve III (2.5 to 2,99 mm); and sieve V (<2.0 mm) at 50% of this batch (Table 11). In the cultivar Quartz, the seeds of the sieve II (> 3.0 mm), IV sieve (2.0 to 2.49 mm) and V (<2.0 mm) also showed reduction in 16% of the evaluated lots. Similar to occurred in the TBIO Sinuelo cultivar, where the original sample and sieves II (> 3.0 mm) and V (<2,0 mm) with 16% of the lots confirmed a lower hectoliter weight.

It is important to note the importance of the standardization of wheat seeds, since each seed that makes up a lot can present different levels of hectoliter (Battisti et al., 2011), influenced by seed density, uniformity, shape and size (Ormond et al. 2013).

In general, the number of spikelets in the main litter varies between cultivars and lots, but there is a tendency of the AO, seeds of the sieves II (> 3.0 mm) and sieve V (<2,0 mm) to provide fewer spikelets. The number of seeds of the principal plant, number of seeds of the main and secondary tillers vary between cultivars and lots, however, there is a tendency in the original sample, where the smaller and larger seeds exhibit fewer seeds in the plant originated.

The results also point out that the AO and plants originated from the seeds of the sieve V (<2,0 mm) tend to offer lower weight of the principal plant and lower productivity. Regarding the contribution of productivity, the tiller has a greater contribution when compared to the main plant.

Table 11 - Means for the interaction genotypes x seeds size x lots, for the variable hectoliter weight

TP**	Ametista											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	80,4	aAα	80,35	aAα	79,73	bAα	80,10	aAα	79,78	aAα	79,99	aAα
II (>3,0 mm)	79,5	aBβ	81,00	aAα	80,28	bABα	80,19	aABα	80,88	aABα	80,07	aABα
III (2,5 a 2,99mm)	80,86	aABα	80,17	aBα	81,90	aAα	79,95	aBα	79,86	aBα	80,50	aBα
IV (2,0 a 2,49mm)	80,45	aAα	80,47	aAα	79,83	bAβ	80,02	aAα	80,17	aAα	79,55	aAα
V (< 2,0 mm)	80,7	aABα	81,30	aAα	79,86	bBα	80,49	aAB	79,87	aBα	79,61	aBα
TP**	Quartzo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	78,92	aAβ	79,18	aAα	78,65	aAα	78,01	aAβ	78,20	abAβ	78,00	aAβ
II (>3,0 mm)	78,43	aABβ	78,52	aABβ	78,50	aABβ	77,98	aABβ	79,30	abAβ	77,68	aBβ
III (2,5 a 2,99mm)	78,30	aAβ	78,95	aAα	78,09	aAΓ	77,91	aAβ	77,93	abcAβ	78,53	aAβ
IV (2,0 a 2,49mm)	78,99	aAβ	78,46	aAβ	78,51	aAβ	78,58	aAβ	76,80	cBβ	78,74	aAα
V (< 2,0 mm)	78,84	aAβ	78,36	aABβ	78,8	aAα	77,86	aABβ	77,37	bcBβ	78,03	aABβ
TP**	TBIO Sinuelo											
	Lot A		Lot B		Lot C		Lot D		Lot E		Lot F	
I (AO)***	81,31	aAα	80,33	aABα	79,90	aBα	77,49	bCβ	80,74	aAα	80,17	aAα
II (>3,0 mm)	81,03	aAα	80,43	aAα	80,88	aAα	80,79	aAα	78,75	bBβ	80,84	aAα
III (2,5 a 2,99mm)	80,29	aAα	80,29	aAα	79,50	aAβ	80,02	aAα	79,69	abAα	79,94	aAα
IV (2,0 a 2,49mm)	80,11	aAαβ	79,85	aAαβ	80,33	aAα	80,05	aAα	80,40	aAα	79,69	aAα
V (< 2,0 mm)	79,95	aAαβ	80,2	aAα	79,86	aABα	78,54	bBβ	80,20	aAα	80,80	aAα
CV (%)	1,09											

* Means followed by the same lowercase letter in column for sieve size, same uppercase letter in line for sieve size between lots and same greek letter between genotypes do not differ statistically from Tukey testa t 5% probability of error.

**SS Sieve Size.

***AO Original Sample of lot without size fractioning.

CONCLUSION

The size of wheat seeds influences the number of spikelets of the principal plant, number of primary and secondary seed, number of seeds of the principal plant, primary and secondary tillers, productivity, mass of thousand seeds and hectoliter weight.

The standardization of wheat seeds provides benefits to the productive yield of wheat plants.

The seeds retained in the sieve V (<2.00 mm) resulted in less productive plants and plants derived from sieve III (2.5 to 2.99 mm) formed plants with productivity being 2.3% higher than the original sample, also, it was 2% higher than the sieve II (> 3,0 mm), 2.7% compared to sieve IV (2.0 to 2.49 mm) and 6% from sieve V (<2.0 mm).

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