Macrothink Institute™

Journal of Agricultural Studies
ISSN 2166-0379
2019, Vol. 7, No. 4

Quality of Ryegrass (*Lolium multiflorum* Lam.) Seeds Obtained From Different Cropping Systems and Farming Environments

Roberto Carbonera (Corresponding author)

Agrarian Studies Department, Regional Northwest University of Rio Grande do Sul (UNIJUÍ), Street of Comércio 3000, Universitário, Ijuí RS, 98700-000, Brazil.

Tel: +55 (55) 99971 44 30 E-mail: carbonera@unijui.edu.br

José Antônio Gonzalez da Silva

Agrarian Studies Department, Regional Northwest University of Rio Grande do Sul (UNIJUÍ), Street of Comércio 3000, Universitário, Ijuí RS, 98700-000, Brazil.

E-mail: jagsfaem@yahoo.com.br

Sandra Beatriz Vicenci Fernandes

Agrarian Studies Department, Regional Northwest University of Rio Grande do Sul (UNIJUÍ), Street of Comércio 3000, Universitário, Ijuí RS, 98700-000, Brazil.

E-mail: sandravf@unijui.edu.br

Laura Fernanda Grinke

Agrarian Studies Department, Regional Northwest University of Rio Grande do Sul (UNIJUÍ), Street of Comércio 3000, Universitário, Ijuí RS, 98700-000, Brazil.

E-mail: lauragrinke@gmail.com

Cleberson Luis Scheer

Agrarian Studies Department, Regional Northwest University of Rio Grande do Sul (UNIJUÍ), Street of Comércio 3000, Universitário, Ijuí RS, 98700-000, Brazil.

E-mail: cleberscheer@yahoo.com.br

Ângela Teresinha Woschinski De Mamann

Federal Institute of Education, Science and Technology of Rio Grande do Sul, Street Nelsi Ribas Fritsch, 1111, Neighborhood Esperança, Ibirubá/RS – Brazil

E-mail: angela.mamann@ibiruba.ifrs.edu.br

Received: August 20, 2019 Accepted: Sep. 2, 2019 Published: Sep. 3, 2019

doi:10.5296/jas.v7i4.15308 URL: https://doi.org/10.5296/jas.v7i4.15308

Abstract

Ryegrass (*Lolium multiflorum* Lam.) is one of the main hibernal forage species in Southern Brazil. In recent years, the demand for high-quality seeds has increased to ensure the productivity of herds. Given this, the present study evaluated the quality of ryegrass seeds obtained from different cropping systems and farming environments. 2,156 samples were evaluated; 900 were evaluated with seed production process, S1 and S2, not certified seed from first and second generations, respectively, 305 were evaluated with seed analysis of own use and 961 were evaluated with tetrazolium analysis. The samples obtained through seed production process were analyzed in terms of their physical and physiological aspects, while the own seed and tetrazolium test used were evaluated only in terms of their physiological attributes, following the methodology described in the Seed Analysis Rules. The data were subjected to the analysis of descriptive statistics. The percentages of the samples that were out of the standards were calculated and compared to the meteorological occurrences in the crop cycles. Seeds in S1 and S2 samples presented lower standard deviations when compared to seeds for own use and tetrazolium. Among S1 and S2 seed samples, 35.3% were rejected for physical and physiological variables, 58% for their own use and 48.1% for tetrazolium were rejected for physiological quality, respectively. High rates of Ryegrass seed samples with lower than recommended quality standards were observed, which requires investments in research and production to improve the seed standards used.

Keywords: ryegrass, seed quality, cropping systems, environment

1. Introduction

The Ryegrass (Lolium multiflorum Lam.) is a hibernal forage widely used in Southern Brazil. It is a species that stands out for its resistance to cold, nutritional quality and potential dry matter production. In addition to high productivity and nutritional quality, Ryegrass presents good seed production, natural resorption capacity, resistance to diseases and versatility of associations with other grasses and legumes (De Conto et al., 2011; Gerdes et al., 2005; Pedroso et al., 2004).

However, according to the same authors, variations of biotic and abiotic factors can result in significant changes in forage production and quality. Among the items that make up these factors, Marchi et al. (2010) and Dos Santos et al. (2014) emphasized the use of low quality sanitary seed lots, seeds with excessive vegetable residues, soil residues and / or seeds from other forage plants and invasive plants that cause negative impacts on forage production and quality for grazing. According to Schuch et al. (2008), the production of seeds of forage species often has been carried out by non-specialized producers, who do not observe certain important agronomic practices to obtain high seeds quality. This leads to variation in the seeds quality of available forage species, which are often marketed in an irregular way (Holbig et al., 2011).

The use of seeds with high quality is a fundamental and valuable factor to the establishment of crops, allowing high yields (Peres, 2010). This is because the quality of the seeds can be considered as a standard of excellence in certain attributes that will contribute to their better performance when exposed to adverse conditions (Filho, 2015). For the variables pure seeds, inert material and other seeds established reliability limits should be used, since the purity test presents great variability in the information obtained when evaluated in different species and within the same species and the time of storage in cold rooms (Fortes et al., 2008). Regarding to that, Carvalho and Nakagawa (2012) point out that as there is evolution of production techniques, standards must be raised gradually in order to improve the produced seed quality.

Studies and research that have been carried out involving the seeds quality, there is a finding that, in most cases, the seeds used in the State of Rio Grande do Sul have quality problems (Schuch et al., 2008). In part, this fact can be justified by the morphology and size of the seed, despite the inflorescence of this species is of the distichous type, erect, with 15 to 20 cm in length, containing about 40 spikelets arranged alternately, protected with straw and containing 10 to 20 fertile flowers per spike (Balasko et al., 1995). Thus, these characteristics contribute to increase the degree of impurities in the lot, which makes it difficult to separate the seeds of Ryegrass and the straw due to their similar weight. Another aspect is the seeds uneven formation, which produces a large number of empty seeds, without caryopsis, hard to remove during processing (Brunes et al., 2017).

Beyond, it is relevant to consider that one of the probable causes for the low quality of Ryegrass seeds is existence of few improved cultivars used by seed producers, who at the same time they produce their own seeds, they contribute to the existence of seeds of inferior physical, genetic and sanitary quality (Brunes and Lucio, 2017). Thus, it is important to carry out a process of producer awareness regarding the production adequacy to minimize the variation among the seeds of the same lot and the importance of using high seeds quality (Bernabé, 2017).

Studies conducted in the years 2008 to 2010 concluded that from 50% to 100% of the Ryegrass samples were below the standard in the purity point (Ohlson, et al., 2011). However, Ohlson et al. (2008) observed that in 2007, all the annual Ryegrass samples analyzed were within the standard. It is believed that the greater organization and formalization of the sector will provide the availability of higher seeds quality. Similar results were obtained by Faria and Guedes (2017) in a study carried out in Santa Catarina state.

Thus, based on Brunes et al. (2017) and aiming to improve the seeds quality of forage species, including Ryegrass, it is necessary to comply with the production and commercialization legislation, associated to investment in research, especially in the knowledge of agronomic characters to improve and adopt dynamic and effective quality control in all stages of production.

The non-use of high seeds quality, in which seeds are characterized by low physical and varietal purity, low viability and high contamination by weed seeds, makes it difficult to decide on the crops distribution and implantation of crops difficulties, thus increasing the risks and costs of production. Therefore, the analysis of representative samples of the lot and the use of standardized methods and procedures are essential for the determination of seed quality.

Therefore, the aim of this study was to evaluate the physical and physiological attributes of Ryegrass seeds produced in southern Brazil.

2. Materials and Methods

The work was performed out based on the analysis of the Ryegrass seed analysis of the Laboratory of Seed Analysis. 2.156 samples of Ryegrass were studied: 900 of categories S1 and S2 (not certified seed from first and second generations, respectively); 305 own-use seed samples and 951 samples analyzed by the tetrazolium test (Table 1).The analyzes were performed in the seed analysis laboratory of the Agronomy course of the Northwest Regional University of Rio Grande do Sul State.

The analysis was carried out following the methods recommended by the Rules of Seed Analysis (Brazil, 1992; 2009). The purity analysis aims to determine the percent composition by weight, the identity of the different seed species and the inert material in the sample and by inference on the seed lot. The used work sample was 6g, being separated into three components: Pure Seed, Other Seeds and Inert Material, which were indicated in percentage by weight of the working sample. Seeds were identified, in addition to pure seeds, in seeds of other cultivated, wild, noxious and tolerated species. The inert material was identified as much as possible and, when requested by the applicant, its weight percentage can be determined, since it is characterized as being: dispersion units which does not contain the seed; anthecia of the species with the caryopsis smaller than the prescribed minimum size; pieces of broken or damaged dispersion units equal to or less than half of their original size; among others, which are described in detail in the RAS (Brazil, 2009).

The determination of other seeds by number was performed in addition to the analysis of purity. For Ryegrass, the complementary weight of 54g was used, which added to the purity analysis, totals 60g and only harmful species were identified and tolerated (Brazil, 1992; 2009).

The variables analyzed in the analysis of purity were the percentage of pure seeds, other seeds and inert material and the number of seeds of other cultivated species, seeds of wild species and harmful tolerated and prohibited species. The seeds lot to be approved must present a minimum of 97% of pure seeds, a maximum of 2.5% of other seeds, a maximum of 15 seeds of cultivated species, 15 of wild species, 10 harmful and zero of prohibited noxious species (Brazil, 2005).

Table 1. Number of samples of Ryegrass seeds studied from 2007 to 2014

Category	2007	2008	2009	2010	2011	2012	2013	2014	TOTAL
Seeds S1, S2	109	95	123	302	53	80	94	44	900
Owen use	18	14	39	77	47	30	56	24	305
Tetrazolium analysis	137	92	120	358	101	40	59	44	951
TOTAL	264	201	282	737	201	150	209	112	2156

S1, S2 (not certified seed from first and second generations, respectively)

The germination test, in turn, evaluates the seeds physiological attributes. In ryegrass, the dormancy overcoming test was performed, using the pre-cooling of seven days, at a temperature of 5 ℃. Afterwards, four sub-samples of one hundred (100) seeds randomly picked from the "pure seed" portion of the sample were seeded. They were sown on six sheets of filter paper, in plastic boxes (gerbox), of size 11.0 x 11.0 x 3.5 cm and placed to germinate at 20-30 ℃. The counts were performed at five and fourteen days after sowing, counting the percentage of normal seedlings, abnormal seedlings and non-germinated seeds, according to the Rules for Seed Analysis (Brazil, 1992; 2009).

The tetrazolium analysis also followed the Seed Analysis Rules (Brazil, 1992; 2009). The seeds were pre-moistened for 18 Hours at 20 ℃. The longitudinal section was cut and subjected to a 0.5% tetrazolium solution. After, it was placed for 5 hours at a temperature of 35 ℃. The interpretation of the feasibility results was then followed.

The meteorological data collected during the period of Ryegrass cultivation were obtained from the meteorological station, located in Augusto Pestana, RS, Brazil (28 °26 '30' S; 54 ° 00' 58 " W). The growing soil is classified as Oxisol Distroferric Typical and the climate of the region matches to CFA (humid subtropical), with the occurrence of hot summers, no occurrence of prolonged droughts, and cold wet winters, according to Köppen's classification.

The results were subjected to descriptive statistical analysis by variable for the years studied and the discrepant data were identified from the means, standard deviation and coefficients of variation, using the GENES program (Cruz, 2013). Finally, the results of the physiological quality were compared with the meteorological occurrences of maximum temperatures and rainfall occurring during the cycle of the specie cultivation.

3. Results and Discussion

The results of the descriptive statistics; mean, maximum value , minimum value and standard deviation for the analyzed variables of pure seeds, other seeds, inert material and number of seeds of cultivated, wild and noxious tolerated species of the seeds samples S1 and

S1 are found in Table 2. In the studied years, number of seeds of noxious forbidden species were identified.

The percentage of pure seeds was 97.2%, with a minimum of 18.6% and a maximum of 99.8%. In the years 2008, 2009 and 2014 the annual average was below the minimum; while in other years the average was higher. Thus, it can be stated that the mean results for purity were higher than the minimum of 97% for the commercialization of seeds of categories S1 and S2, according to IN number 25, of December 16th, 2005 (Brazil, 2005).

The average percentage of inert material was 2.6%, ranging from zero percent to 34.5%, while the presence of other seeds presented an average of 0.2%, with a variation from zero to 46.9%. In average terms, in no year there was a disapproval for this character. Compared with the standard for the species, maximum of 2.5%, the average of other seeds was well below that established for the species. The presence of other seeds per number obtained an average of 3.1 seeds per sample. Out of these, 0.9 seeds of cultivated species, 1.7 wild and 0.5 tolerated harmful. The samples presented high variations, from zero to 173 seeds (Table 2).

Ternus et al. (2018) studied lots of annual Ryegrass seeds from the 2013 to 2015 harvests in the state of Santa Catarina. They found that the average physical purity of seeds remained below the standard, ranging from 91.9 to 93.7%. However, they observed an evolution in the results over the years, with the average of pure seed of the lots starting from 91% in the year 2013 to 97% in the year 2016. In 2014 only the average among the lots, in relation to the number of seeds of other cultivated species, remained within the standards for ryegrass seeds of the categories S1 and S2. As for the number of wild, harmful and prohibited seeds from 2014 and after the observed values were within the required standards (Ternus et al., 2018).

However, Brunes et al. (2017), analyzing 113 samples of Ryegrass, from the seed analysis laboratory of the Federal University of Santa Maria (LAS / UFSM), found the lowest average of pure seeds (92.8%). Thus, they claim that they are of low quality with purity below the minimum standard of marketing required by the legislation, considering that, of the total, 69% presented values below the minimum standard required by the 97% legislation.

In the same study by Brunes et al. (2017), there was also a high percentage of inert material (6.3%) and other seeds (1.0%). In addition to presenting the lowest percentage of pure seeds, the analyzes of Ryegrass seeds presented the highest variability among the evaluated species for the percentage of pure seeds, inert material and other seeds, with values of the standard deviation of 6.35, 5.66 and 2.76%, respectively, revealing significant variability of this species when compared to the others evaluated.

Journal of Agricultural Studies
ISSN 2166-0379
2019, Vol. 7, No. 4

Table 2. Results of the descriptive statistics (DS), number of samples (N), mean values ($\bar{x}$) standard deviation (SD), maximum number (Max), minimum number (Min), pure seeds (%), inert material (%), other seeds (%), number of other seeds by number, number of cultivated species seeds, number of wild species, number of tolerated harmful species in ryegrass seeds S1 and S2 analyzed from 2007 to 2014

Variable	DS	Years/seed purity								
		2007	2008	2009	2010	2011	2012	2013	2014	Mean
Pure seeds (%)	N	109	95	123	302	53	80	94	44	-
	$\bar{x}$	97.6	96.3	96.9	97.3	98	97.6	97.1	96.4	97.2
	SD	1.79	4.8	2.1	5.9	1.6	3.2	3.7	4.4	4.3
	Max	99.3	99.8	99.4	99.8	99.4	99.6	99.5	98.9	99.8
	Min	88.0	83	84.2	18.6	87.4	73.6	74.1	72.9	18.6
		Purity decomposition								
Inert material (%)	$\bar{x}$	2.2	3.4	3.0	2.4	2.0	2.4	2.8	3.4	2.6
	SD	1.6	4.3	2.0	3.7	1.6	3.2	3.6	4.0	1.7
	Max	9.2	15.8	15.0	34.5	12.5	26.2	25.2	25.6	34.5
	Min	0.1	2.0	6.0	0.0	5.0	0.4	0.5	1.0	0.0
Other seeds (%)	$\bar{x}$	0.1	0.4	0.1	0.3	0.1	0.0	0.0	0.2	0.2
	SD	0.3	1.4	0.3	2.8	0.1	0.1	0.1	0.6	1.7
	Max	2.8	13.6	0.9	46.9	0.7	0.4	0.7	3.4	46,9
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Purity decomposition, other seeds by number								
Number of other seeds by number	$\bar{x}$	5.9	4.7	3.8	2.2	1	2.2	1.7	4.9	3.1
	SD	13.4	8.1	5.8	11.7	1.4	5.3	6.7	8.6	9.6
	Max	130	39	41	173	5	40	54	40	173
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cultivated species	$\bar{x}$	0.7	1.7	0.9	1.1	0.3	0.2	0.2	1.6	0.9
	SD	2.3	4.6	2.1	10.7	0.7	0.4	1	5.4	6.6
	Max	19	22	12	166	3	2	6	30	166
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wild species	$\bar{x}$	3.9	1.8	2.2	1.0	0.4	1.2	1.1	2.0	1.7
	SD	12.7	4.3	4.9	3.5	0.8	1.8	6.1	2.1	5.8
	Max	130	23	41	35	3	9	54	10	130
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tolerated harmful species	$\bar{x}$	1.23	0.9	0.7	0.1	0.3	0.8	0.3	1.3	0.5
	SD	3.83	2.2	2.3	0.4	0.6	4.4	1.4	5.1	2.5
	Max	17	15	13	5	2	35	12	28	35
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results of the physiological analyses obtained from the years 2007 to 2014, the categories

S1 and S2, evaluated by the germination test, are presented in Table 3. The mean number of normal seedlings in the eight years evaluated was 75.6%. Still, 3.7% of abnormal seedlings and 20.7% of dead seeds were obtained. The average results were higher than the established minimum of 70% (Brazil, 2005).

As it can be seen, in 2007 the best percentage of germination was achieved with 80.9% of normal seedlings and the year with the lowest performance was 72.6% in 2010. The standard deviation was 17.4, with a maximum 99% and minimum 0.0%.

Regarding to the results of abnormal seedlings, the average of 3.7% of all samples analyzed in the period was obtained. The standard deviation was 3.8, the mean of the maximum was 31.0% and the mean of the minimum was 0.0%. The year 2009 presented the highest percentage of abnormal seedlings with 4.8%.

Table 3. Results of the descriptive statistics (DS), number of samples (N), mean ($\overline{X}$), standard deviation (SD), maximum (Max), minimum (Min) to normal seedlings, abnormal seedlings and dead seeds in ryegrass seeds S1 and S2 analyzed between 2007 and 2014

Variable	DS	Germinated seeds								
		2007	2008	2009	2010	2011	2012	2013	2014	Mean
Normal seedlings (%)	N	109	95	123	302	53	80	94	44	-
	$\overline{X}$	80.9	77.4	74.8	72.6	79.4	77.9	73.5	76.6	75.6
	SD	12.0	17.7	17.1	19.9	12.9	14.2	16.7	18.4	17.4
	Max	92.0	98.0	95.0	96.0	99.0	97.0	98.0	95.0	99.0
	Min	33.0	21.0	0.0	18.0	39.0	42.0	6.0	6.0	0.0
Abnormal seedlings (%)	$\overline{X}$	2.6	2.6	4.8	4.3	3.6	4.1	2.5	3.6	3.7
	SD	3.4	3.6	4.1	3.2	4.8	5.5	3.3	2.0	3.8
	Max	31.1	14.0	31	25.0	20.0	29.0	19.0	8.0	31.0
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dead seeds (%)	$\overline{X}$	16.5	19.9	20.3	23.2	17.0	18.0	24.0	19.3	20.7
	SD	10.4	16.9	16.6	18.7	8.9	11.4	15.4	17.8	16.1
	Max	63.0	72.0	94.0	79.0	42.0	54.0	87.0	88.0	94.0
	Min	5.0	2.0	3.0	2.0	1.0	3.0	1.0	0.0	0.0

The average value of the dead seeds observed in the eight years was 20.7%, with the highest percentage in 2013 with 24% and the lowest in 2007 with 16.5%. The standard deviation for dead seeds was 16.1, with maximum of 94.0% and minimum of 0.0%. Table 4 shows the results from the seed germination analysis for own use. In the eight analyzed years; the average of normal seedlings was 58.3%, lower than the minimum of 70% (Brazil, 2005). The standard deviation was 26.2 with a maximum 98.0% and minimum 0.0%. In the years 2007 and 2008, the average germination results were 74.0% and 70.6%, respectively, above the required standard. In other years, however, from 2009 to 2014, the averages were below the standards.

Observing the results of abnormal seedlings the average was 4.7%. The standard deviation

Journal of Agricultural Studies
ISSN 2166-0379
2019, Vol. 7, No. 4

was 5.1, the mean of the maximum 36.0% and the mean of the minimum 0%. The year of 2014 had the highest percentage of abnormal seedlings with 6.6%, while in 2008 the lowest 1.2%. The average number of dead seeds was 36.9%, with the highest value in 2014 with 47.7% and the lowest percentage in 2007 was 24.7%. The standard deviation was 25.1 with mean maximums of 100% and mean minimums of 1%.

When comparing Tables 3 and 4, it can be seen that in the seed samples for own use, the percentage of normal seedlings decreased significantly, not reaching the minimum germination stipulated IN 25/2005 (Brazil, 2005).

Table 4. Results of the descriptive statistics (DS), number of samples (N), mean ($\overline{X}$) standard deviation (SD), maximum (Max), minimum (Min) to normal seedlings, abnormal seedlings and dead seeds in own use seeds in Ryegrass analyzed between 2007 and 2014

Variable	DS	Germination own use seeds								
		2007	2008	2009	2010	2011	2012	2013	2014	Mean
Normal seedlings (%)	N	18	14	39	77	47	30	56	24	-
	$\overline{X}$	74.0	70.6	48.6	55.4	67.2	61.0	57.4	45.7	58.3
	SD	24.7	21.4	26.3	25.4	25.4	22.1	23.5	32.7	26.2
	Max	97.0	96.0	96.0	92.0	95.0	98.0	97.0	97.0	98.0
	Min	11.0	38.0	1.0	0.0	2.0	18.0	3.0	0.0	0.0
Abnormal seedlings (%)	$\overline{X}$	1.3	1.2	6.1	3.8	4.8	4.1	6.5	6.6	4.7
	SD	1.1	0.7	4.9	4.4	5.0	5.5	5.8	6.0	5.1
	Max	4.0	2.0	16.0	36.0	26.0	30.0	23.0	25.0	36.0
	Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dead seeds (%)	$\overline{X}$	24.7	28.1	45.3	40.8	27.9	34.9	36.1	47.7	36.9
	SD	25.1	21.1	24.8	24.8	24.2	22.1	21.7	31.9	25.1
	Max	87.0	61.0	99.0	100.0	98.0	80.0	97.0	100.0	100.0
	Min	1.0	2.0	3.0	4.0	2.0	1.0	3.0	3.0	1.0

Table 5 shows the viability of the seeds analyzed by the tetrazolium test. The average of 63.4% of viable seeds was verified in 951 analyzed samples. In 2010, there was a greater demand for this type of analysis, with 358 analyzed samples. However, the mean values of the analyses were lower in 2010 and 2012, with 57.4% and 57.3%, respectively.

Table 5. Results of the descriptive statistics (DS), number of samples (N), mean ($\overline{X}$) standard deviation (SD), maximum (max), minimum (Min), to viable seeds through tetrazolium test in ryegrass analyzed between 2007 and 2014

Variable	DS	Viability seeds through tetrazolium test								
		2007	2008	2009	2010	2011	2012	2013	2014	Mean
Viability (%)	N	137	92	120	358	101	40	59	44	-
	$\overline{X}$	68.3	75.1	65.9	57.4	65.0	57.3	65.0	65.3	63.4
	SD	25.9	20.6	23.8	27.4	24.0	26.2	27.5	24.4	26.2
	Max	97.0	98.0	96.0	97.0	96.0	95.0	95.0	97.0	98.0
	Min	2.0	4.0	0.0	0.0	2.0	0.0	5.0	5.0	0.0

This high number of samples versus the obtained average viability in the year can be explained by the high seed demand that occurred in the year. The average viability of 63.4% was below the established standards. Only in 2008 the average was higher than the minimum.

According to Grabe (1976), the tetrazolium test was developed to provide quick estimation of seed viability. Such estimations are useful to facilitate the purchase and handling of seeds, dormant seed testing lots, preliminary testing on seed control work, evaluating seed lots for vigor, supplementing germination tests and diagnosing causes of seed deterioration.

Among the analyzed variables, for the categories of seeds S1 and S2, the variable that failed a higher percentage of analyzes was the germination test, with 17.7% of the samples, Table 6. Then, the percentage of pure seeds failed 7.4% and germination and purity together failed 6.1%. Out of the total of 900 samples, 318 failed, that is 35.3%. When observing the failure rate of samples per year of cultivation, it was observed that the highest index 54.5% in 2009.

In seeds for their own use, 58% of the samples were reproved by germination, while in the analyzed by tetrazolium, 48.1% were rejected for viability.

In Figure 1, the meteorological conditions of maximum temperatures and precipitations occurring during the period of ryegrass cultivation are presented. It can be observed that the years of higher temperatures and rainfall precipitations, tend to be the greater problems with seed germination and viability. Thus, the years 2009, 2010 and 2014 suffered negative interference, while the years 2007, 2008, 2011 and 2012 were favorable. This is because intense precipitations during vegetative development favor the leaching and loss of nutrients and intense rainfall during physiological maturity and harvest adversely affect the physiological seeds quality (Pedó et al., 2013; Castro et al., 2016).

A high seed quality must have high vigor, high germination and sanitation standards, and a guarantee of physical and varietal purity. The data obtained in other developed papers with Ryegrass seeds indicate that different managements can achieve high yields with high seed quality, but that there are still difficulties in the productive process, such as the control of fungal diseases, the harvest time / method and drying of seeds (Mello and Silva, 2017).

Journal of Agricultural Studies
ISSN 2166-0379
2019, Vol. 7, No. 4

Table 6. Information of the samples of ryegrass failed by physical and physiological variables between 2007 and 2014

Variable\ Years	2007	2008	2009	2010	2011	2012	2013	2014	total	% disap.
					Seeds S1 e S2					
Total samples	109	95	123	302	53	80	93	44	900	
Purity (Pur)	11	5	34	11			2	4	67	7.4
Germinatin (Germ)	13	12	18	80	7	9	14	6	159	17.7
Wild (Wil)	1								1	0.1
Nocious tolerant (Noct)	6		2						8	0.9
Wil + Noct	1								1	0.1
Pur + Germ	3	12	11	19	1	1	5	3	55	6.1
Pur + Out + Cult	1			2					3	0.3
Pur + Wil + Germ		1							1	0.1
Pur + Cult + Germ		3						1	4	0.4
Pur + Wil + Noct + Germ		1					1		2	0.2
Pur + Wil		1		3			1		5	0.6
Pur + Out + Wil		1							1	0.1
Wil + Germ			2	2					4	0.4
Pur + Out + Cult + Germ				2				1	3	0.3
Pur + Noct + Germ						2			2	0.2
Pur + Noct								2	2	0.2
Disapproved Pur; Germ	36	36	67	119	8	12	23	17	318	35.3
Disapproved per year (%)	33.0	37.9	54.5	39.4	15.1	15.0	24.7	38.6	35.3	
					Own use					
Total samples	18	14	39	77	47	30	56	24	305	
Disapproved Germ	6	6	31	46	20	16	35	17	177	58.0
Disapproved per year (%)	33.3	42.9	79.5	59.7	42.6	53.3	62.5	70.8	58.0	
					Tetrazolium					
Total samples	137	92	120	358	101	40	59	44	951	
Disapproved Viability	57	26	58	202	46	24	23	21	457	48.1
Disapproved per year (%)	41.6	28.3	48.3	56.4	45.5	60.0	39.0	47.7	48.1	

Thus, a constant improvement in the physical quality of ryegrass seeds is required, and according to Paiva et al. (2008), the demand for seeds of good physical, physiological and sanitary quality has increased mainly to meet the strict phytosanitary standards imposed by importing countries, which has motivated competition among the producers contributing to the improvement of seed quality. So that, during all stages of the seed production process, measures must be taken to avoid genetic or varietal contamination, and seeds with the desired characteristics are available to the farmer (Ternus et al., 2018).

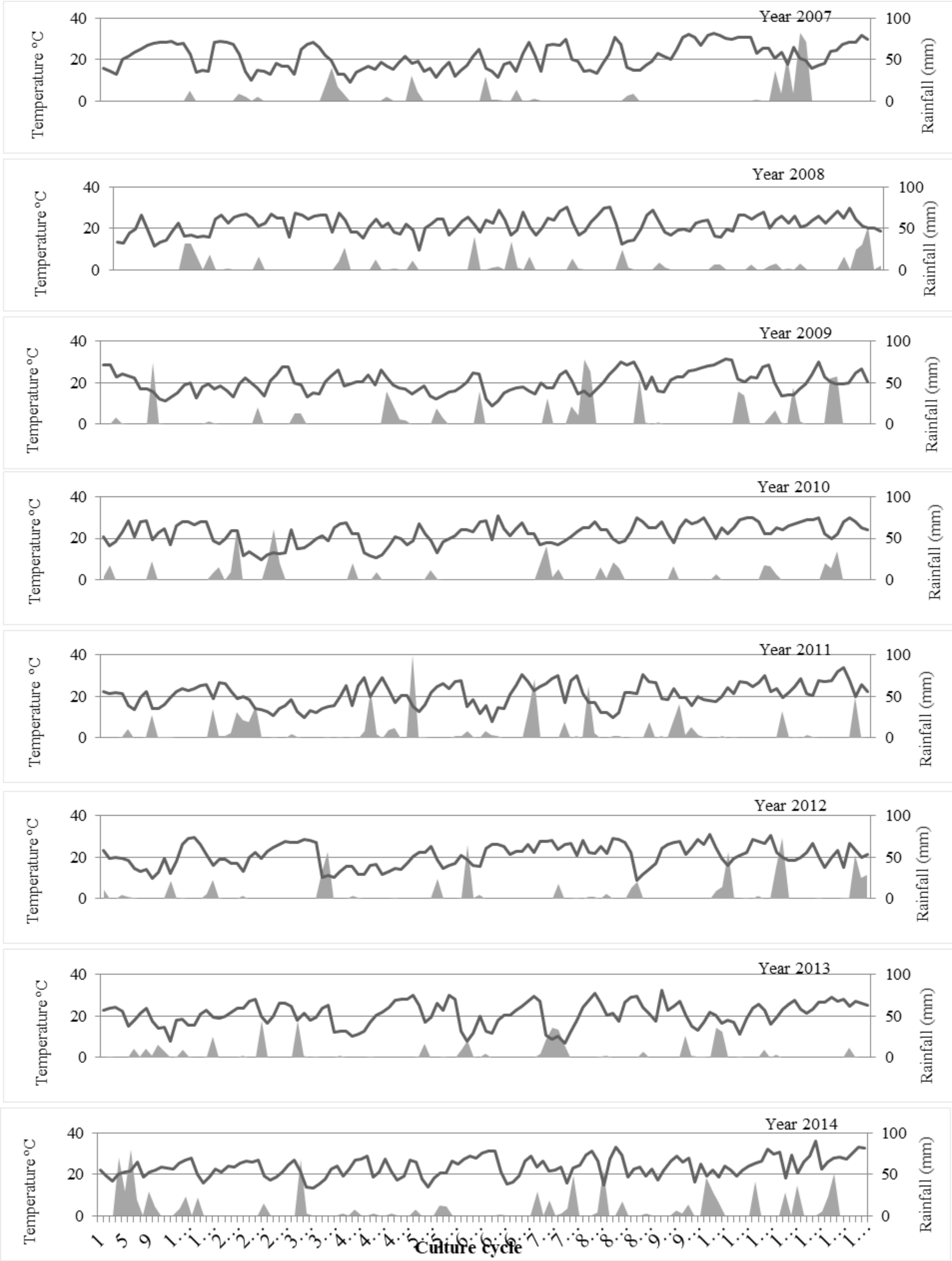

Figure 1. Maximum temperature (℃) and rainfall (mm) occurred during the crop cycle of Ryegrass, from June to September in the years from 2007 to 2014

It is noticed that there is a necessity of evolution in the quality improvement of the lots of ryegrass seeds produced. In this sense, the importance of external quality control through fiscal activity is evident. These actions, carried out in an organized manner, assure the farmers access to higher seeds quality, favoring the cultivars performance, reducing production costs due to the reduction of sowing density, and maximizing the pastures productivity grown in the Southern Brazil.

4. Conclusion

According to the findings, Ryegrass seeds belonging to categories S1 and S2 showed on average 97.2% purity and 75.6% germination. However, 35.3% of the samples failed, due to germination, purity, combination of both, or other analyzed variables. Among the seeds for own use, 58% of the samples were below standard by the germination test and 48.1% of the samples by the tetrazolium test. The inert material variable had greater negative interference in the purity and dead seeds in the germination. The years 2009, 2010 and 2014 were negatively affected by the environment, while 2007, 2008, 2011 and 2012 were favorable. Thus, it is concluded that there is a high degree of seeds produced with low physical and physiological quality standards indicating that there is a need for a continuous process of research and improvement of production methods to improve the standards produced seeds.

References

Balasko, J. A., Evers, G. W., & Duell, R. W. (1995). Bluegrasses, ryegrasses and bentgrasses. In: Barnes RF, Miller DA, Nelson CJ (1995). Forages: An introduction to grassland agriculture. Iowa-USA: Iowa State University Press, p. 357-372.

Bernabé, A. (2017). Combate à pirataria e casos de sucesso em Mato Grosso. *Informativo Abrates*, *27*(2), 44.

Brazil (1992). Ministério da Agricultura e Reforma Agrária. Regras para análise de sementes. Brasília: SNDA/DNDV/CLAV. 365p.

Brazil (2005). Instrução Normativa nº25, de 16/12/2005. Diário Oficial da União, Brasília, Seção 1, p.18.

Brazil (2009). Ministério da Agricultura, Pecuária e Abastecimento. Regras para análise de sementes. Brasília: MAPA/ACS. 399p.

Brunes, R. R., & Lúcio, A. D. (2017). Relações entre as variáveis das análises de sementes de espécies agrícolas. *Revista Brasileira de Ciências Agrárias, 12*(3), 289-295. https://doi.org/10.5039/agraria.v12i3a5451

Brunes, R. R., Lúcio, A. D., & Nunes, U. R. (2017). Limites de confiabilidade para pureza e germinação de sementes de espécies agrícolas. *Revista Brasileira de Ciências Agrárias, 12*(4), 415-420. https://doi.org/10.5039/agraria.v12i4a5469

Carvalho, N. M., & Nakagawa, J. (2012). Sementes: ciência, tecnologia e produção. 5.ed. Jaboticabal: Funep. 590p.

Castro, E. M., Oliveira, J. A., Lima, A. E., Santos, H. O., & Barbosa, J. I. L. (2016). Physiological quality of soybean seeds produced under artificial rain in the pre-harvesting period. Journal of Seed Science. *Viçosa, ABRATES, 38*(1), 14-21. https://doi.org/10.1590/2317-1545v38n1154236

Cruz, C. D. (2013). GENES - a software package for analysis in experimental statistics and quantitative genetics. *Acta Scientiarum, 35*(3), 271-276. https://doi.org/10.4025/actasciagron.v35i3.21251

De Conto, L., Sganzerla, D. C., Pedroso, C. E. S., & Monks, P. L. (2011). Relação azevém anual (Lolium multiflorum Lam.) – *Ruminante. Archivos de Zootecnia, 60*(1), 41-54.

Dos Santos, G. R., Tschoeke, P. H., Silva, L. G., Da Silveira, M. C. A. C., Reis, H. B., Brito, D. R., & Carlos, D. S. (2014). Sanitary analysis, transmission and pathogenicity of fungi associated with forage plant seeds in tropical regions of Brazil. *Journal of Seed Science, 36*(1), 054-062. https://doi.org/10.1590/S2317-15372014000100007

Faria, R. M., & Guedes, R. S. (2017). Diagnóstico do segmento de produção de sementes no Estado de Santa Catarina nas safras 2015 e 2015/2016. 19f. Trabalho de Conclusão de Curso (Agronomia, Universidade Federal de Santa Catarina), Florianópolis.

Filho, J. M. (2015). Fisiologia de sementes de plantas cultivadas. 2 ªEd., Londrina: ABRATES, 659 p.

Fortes, F. O., Lúcio, A. D., Lopes, S. J., Carpes, R. H., & Silveira, B. D. (2008). Agrupamento em amostras de sementes de espécies florestais nativas do Estado do Rio Grande do Sul - Brasil. *Ciência Rural, 38*(6), 1615-1623. https://doi.org/10.1590/S0103-84782008000600019

Gerdes, L., De Mattos, H. B., Werner, J. C., Colozza, M. T., Dos Santos, L. E., Da Cunha, E. A., ... & Schammass, E. A. (2005). Características do dossel forrageiro e acúmulo de forragem em pastagem irrigada de capim-aruana exclusivo ou sobressemeado com uma mistura de espécies forrageiras de inverno. *Revista Brasileira de Zootecnia, 34*(4), 1088-1097. https://doi.org/10.1590/S1516-35982005000400002

Grabe, D. F. (1976). Manual do Teste de Tetrazólio em Sementes: Contribuição n. 29 ao Manual de Análise de Sementes. Brasília: Ministério da Agricultura.

Holbig, L. S., Harter, F. S., Galina, S., Deuner, C., & Villela, F. A. (2011). Diferenças na qualidade física e fisiológica de sementes de aveia preta e azevém comercializadas em duas regiões do Rio Grande do Sul. *Revista da FZVA, 8*(2), 70-80.

Marchi, C. E., Fernandes, C. D., Bueno, M. L., Batista, M. V., & Fabris, L. R. (2010). Microflora fúngica de sementes comerciais de Panicum maximum e Stylosanthes spp. *Semina: Ciências Agrárias, 31*(3), 575-584. https://doi.org/10.5433/1679-0359.2010v31n3p575

Mello, M. B., & Silva, G. M. (2017). Análise e diagnóstico da produção de sementes de azevém (Lolium multiflorum Lam.). In: Simpósio de iniciação científica da Embrapa Pecuária Sul, 7, 2017, Bagé. Resumos... Bagé: Embrapa Pecuária Sul. p. 12.

Ohlson, O. C., Grzybowski, C. R. S., Da Silva, B. A., Nogueira, J. L., & Panobianco, M. (2011). Análise exploratória de dados: qualidade de sementes de azevém comercializadas no Estado do Paraná. *Informativo Abrates, Londrina, 21*(3), 47-51.

Ohlson, O. C., Souza, C. R. de, & Panobianco, M. (2008). Levantamento da qualidade de sementes de azevém comercializadas no Estado do Paraná. *Informativo Abrates, Londrina 18*(1,2,3), 18-22.

Paiva, A. S., Rodrigues, T. J. D., Cancian, A. J., Lopes, M. M., & Fernandes, A. C. (2008). Qualidade de sementes de macrotiloma (Macrotyloma axillare) Cv. Java. *Revista Brasileira de Sementes, 30*(2), 130-136. https://doi.org/10.1590/S0101-31222008000200016

Pedó, T., Martinazzo, E. G., Aumonde, T. Z., & Villela, F. A. (2013). Princípios fisiológicos na produção de sementes. In: Schuch, L. O. B, Vieira, J. F., Rufino, C. A., & Júnior, J. S. A. Sementes: produção, qualidade e inovações tecnológicas. Pelotas: Editora Gráfica Universitária. p.363-382.

Pedroso, C. E. S., Medeiros, R. B., Da Silva, M. A., Da Jornada, J. B. J, Saibro, J. C., & Teixeira, J. R. F. (2004). Produção de ovinos em gestação e lactação sob pastejo em diferentes estádios fenológicos de azevém anual. *Revista Brasileira de Zootecnia, 33*(5), 1345-1350. https://doi.org/10.1590/S1516-35982004000500029

Peres, W. B. (2010). Incrustamento em sementes de azevém anual (Lolium multiflorum Lam.): características físicas e qualidade fisiológica. 53 f. Tese (Doutorado em Ciência e Tecnologia de Sementes) Universidade Federal de Pelotas, Pelotas.

Schuch, L. O. B., Kolchinski, E. M., & Cantarelli, L. D. (2008). Relação entre a qualidade de sementes de aveia preta e a produção de forragem e de sementes. *Revista Scientia Agraria, 9*(1), 1-6. https://doi.org/10.5380/rsa.v9i1.10125

Ternus, R. M., Cavalcante, J. A., Weiss, A. C., Folquini, O. S., Philippi, E., & Zanini, G. D. (2018). Qualidade de sementes de azevém anual e seus impactos no estabelecimento inicial em diferentes densidades de semeadura. *Archivos de Zootecnia*, *66*(258), 191. https://doi.org/10.21071/az.v67i258.3653