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External Quality Control: Official Results of Forage Seeds Quality

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Abstract

The objective of this work to evaluate the official results of seeds quality of ryegrass, black oat grass, sudangrass and pearl millet, originated from commercial establishments from the State of Santa Catarina. Lots of forage seeds sampled in the state of Santa Catarina in the year of 2013 to 2015, presented low physiologic and physic quality, being the main criteria of disapproval the physic purity and germination. The samples of forage seeds from C1 and C2 categories collected in Santa Catarina present superior quality in relation to the non-certified S1 and S2. The quality of ryegrass seeds (national) showed below the legal standards established, independent of the year, for the physic purity and germination criteria. Although, for the ryegrass lots (imported) there was none disapproval related to germination and physic purity being out of the tolerated limits.The germination and physic purity indexes, for sudangrass lots presented conformity index adequate to the tolerated limits allowed by legal standards. In the other hand, for the same species, the criteria for number of other cultivated species presented 100% of disapproval for the analyzed lots in the non-certified categories in 2013. Lots of pearl millet seeds, with exception of those from the C2 category sampled in 2014, presented in conformity to the legal standards required, being, in comparison with the other species, the one that showed lower non-conformity degree in the analyzed period.

Keywords: *Lolium multiflorum*, *Avena strigosa*, *Avena sativa*, *Sorghum sudanense*, *Pennisetum glaucum*

1. Introduction

The productive chain of Brazilian forage seeds has considerably grown in last years and, alongside this development, the market is demonstrating ascendant demand for materials that are sound, high physiologic quality and low financial cost (Ohlson et al., 2009; Kavalco et al., 2016; Szareski et al., 2018a). This rise is evidenced in large milk production centers, as is the case of the Santa Catarina state, which requires the implementation of pasture in order to supply the animals' nutritive demand, mostly in winter periods.

However, in order to obtain high quality pasture, it is necessary the use of high quality seeds that express, on field, all its genetic potential (Zimmer et al., 2017; Szareski et al., 2018b). Although, the Santa Catarina state, according to Ternus et al. (2016), is essentially a seed costumer, being supplied, mostly, by the state of Rio Grande do Sul, which production of forage seeds is commonly originated from areas destined for grazing and after deferred for harvesting, originating low quality seeds (Medeiros & Nabinger, 2001; Carvalho et al., 2016a; Pelegrin et al., 2016).

Seeking to regulate the identity and quality of the multiplication material produced and commercialized all over the National territory, the Ministry of Agriculture, Livestock and Food Supply (MAPA) instituted, through the Law nº 10.711, from August 5, 2003, the called Seeds Law. It regulated the seeds production and introduced to the country a Production System of Certified Seeds, containing the following categories: Basic, Certified of first generation (C1) and Certified of second generation (C2). Still, outside the certification system, it were instituted the seeds of first generation (S1) and seeds of second generation (S2) (Brasil, 2003).

In the opposite of granule species, the seeds of forage species do not possess an alternative use when under the minimum commercialization standard, having a unique destination, the disposal (Souza, 2003). In this manner, there is the necessity of higher control in the seeds production of these species, especially in the parameters of pure seeds and germination.

In this manner, it is constantly necessary the policing of seeds trade, where, besides verifying documentation, analyses the seeds quality through the collecting of official samples, checking the ICQ administrated by the own seed producer. This proceeding its necessary in order to state if the information described in the package are in conformity to the minimum standards related to the physical and physiological quality, absence of other species, weeds seeds, in addition to not present dandified or deteriorated seeds (Brasil, 2009). Due to the scarce works related to the results of seeds quality of forage, it was the objective of this work to evaluate the official results of seeds quality of ryegrass, black oat grass, sudangrass and pearl millet, originated from commercial establishments from the State of Santa Catarina.

2. Material and Methods

The experiment was conducted together with the State Input Inspection Program, of the Input Inspection Division (DIFIA), of the State Department of Vegetal Defense (DEDEV), bound to the Directory of Agricultural Defense from CIDASC, headquarters at Florianópolis, Santa Catarina. It was used seeds samples of ryegrass (national and imported), black oat grass, oat, sudangrass and pearl millet from different categories, sampled by FEA, in serial municipalities of the State, according to the Service Instruction annually publishedby the DEDEV.

The sampling was realized in registered establishments that are randomly inspected. However, all the merchants are checked in a period inferior to two years. Besides, the inspection service takes on consideration the commercial aptitude from each establishment, which means, the type and frequency of each commercialized input by season, in order to optimize the sampling proceeding. The IS establishes that the more representative batches, that are exposed to sale, must be sampled. A computerized system makes the management of the sampled batches and restricts the collection of two fiscal samples from a same lot. The official sampling is realized according to the precepts established by the Seeds Analysis Rules (Brasil, 2009). All the samples are collected in duplicates. In the period that goes from the harvest until the dispatch to the Official Laboratory (LANAGRO), the samples are conditioned in craft paper and stored in expanded polystyrene boxes. The average time foreseen for the dispatch of the sample to LANAGRO is of 72 hours, counting from the moment of the sampling at the commercial establishment. From this moment, it is necessary to wait for the analysis result according to the specie in examination, according to the deadlinespre-established by the Seeds Analysis Rules (Brasil, 2009).

In this manner, based on the official reports of seeds analysis (BASO) corresponding to the period between 2013 to 2015, it was tabulated the results obtained from official samplings realized by the inspection, in order to execute the external quality control (CEQ) of the State of Santa Catarina. The chosen period was consistent to the beginning of the quality control, having as a tool the sample collection, result of the covenant with the National territory, the Ministry of Agriculture, Livestock and Food Supply (MAPA), which, through the Official Laboratory (LANAGRO), located in the city of São José-SC, realized the following analysis:

Purity Analysis: it was realized according to the Seeds Analysis Rules (RAS) recommendations (Brasil, 2009). Results were expressed in percentage of pure seeds.

Germination: the germination test was conducted as prescribed in the RAS (Brasil, 2009). It was used 400 seeds, which were sowed in *germitest* paper, wetted with distilled water in an amount of 2.5 times the paper mass. The samples were incubated at recommended temperature, and the evaluations realized in the indicated days for each species, after the sowing. The evaluations were realized according to the established standard for each species and the results were expressed in percentage.

Determination of Other Seeds by Number: it was realized from a sample, as prescribed in the RAS (Brasil, 2009) for each specie in study, where it was verified the number of seeds from other species present in the sample. It was considered as seeds of other species those that do not belong to the sample in examination, including seeds of cultivated, wild and harmful tolerated species.

The data were submitted to descriptive analysis, with variables characterized as discreet quantitative, organized in descriptive tables, in which it was utilized the Standard Deviation as a measure of dispersion. The results from official reports of seeds analysis (BASOS) were compared with the legal standards presented in Table 1.

Table 1. Standards for seeds commercialization of ryegrass, black oat grass, oat, sudangrass and pearl millet

Specie	Category	Critérios				
		Purity	Germination	Nº Other Cultivated Species	Nº Wild Seeds	Nº Tolerated Harmful
Ryegrass	C1	97	70	5	5	2
	C2	97	70	10	10	5
	S1	97	70	15	15	10
	S2	97	70	15	15	15
Black oat grass	C1	98	80	6	9	3
	C2	98	80	6	9	3
	S1	98	80	12	20	6
	S2	98	80	20	20	6
Oat	C1	98	80	3	3	1
	C2	98	80	3	5	2
	S1	98	80	8	5	3
	S2	98	80	8	5	3
Sudangrass	C1	97	60	30	30	10
	C2	97	60	30	30	10
	S1	97	60	60	60	15
	S2	97	60	60	60	15
Pearl Millet	C1	95	75	8	8	8
	C2	95	75	15	15	20
	S1	95	75	30	30	40
	S2	95	75	30	30	40

Source: Normative Instructions (MAPA) n° 25/2005, 30/2008, 33/2010 and 45/2013.

3. Results and Discussion

The data from the quality of seeds samples from national and imported cultivars from different categories, originated from the inspection of the ryegrass seeds commerce (*Lolium multiflorum* Lam.) in the State of Santa Catarina, in the years of 2013, 2014 and 2015 are presented in Table 2. Considering the results of the national cultivars in the year of 2013 (Table 2), among 36 collected lots, 25% belonged to the category non-certified with origin proved of first generation (S1) and 75% of second generation (S2). The same result was observed for the year 2014 and 2015, being collected only lots of seeds from de S1 and S2 category, with 59 lots collected in the year of 2014 and 75 in the 2015 year.

The same way, in relation to the samples of imported cultivars, the samebehaviorwas observed in the national samples, for each it was collected only samples from the S1 and S2 samples, with 7, 11 and 21 collected samples in the years 2013, 2014 and 2015, respectively (Table 2). These results demonstrate a probable increase in the use of imported ryegrass in the State of Santa Catarina and more rigor in the external quality control (CEQ) in this state, since it occurred a considerable rise in the number of collected samples during the years under evaluation. This same behavior was observed by Ternus et al. (2016), which verified increase of 20% in the seeds commercialization of imported ryegrass (tetraploid) in commercial establishments in Santa Catarina in the year of 2015 in relation to 2014.

Table 2. Average values from the quality of seeds samples of national and imported cultivars from the inspection of the ryegrass commerce in the state of Santa Catarina, years of 2013, 2014 and 2015

Year	Cat	Samples	Purity (%)	Germination (%)	Nº OCS	Nº WS	Nº HT
National cultivars							
2013	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	9	93.3±2.6*	46±15	5±3	9±4	2±2
	S2	27	88.9±7.5	45±14	23±23	8±7	4±3
2014	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	2	96.6±0.6	67±1	1±1	5±2	1±1
	S2	57	93.3±4.1	56±16	3±3	4±4	6±6
2015	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	29	91.5±5	50±17	16±16	4±4	23±23
	S2	46	94.3±2.5	53±14	7±7	2±2	47± 46
Imported Cultivars							
2013	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	2	99.8±0.1	95±2	0	0	0
	S2	5	99.1±1.2	79±15	0	0	0
2014	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	1	99.4	97	0	0	0
	S2	10	96.8±1.4	76±9	4±3	23±22	2±2
2015	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	11	99.7±0.2	94±1	0	0	0
	S2	10	98.7±0.4	83±7	0	1±1	0

Note. OCS: Seeds form other cultivated species; WS: Seeds of Wild Species; HT: Seeds of Tolerated Harmful species. *Standard Deviation.

In relation to the analysis of purity and germination (Table 2), it was observed that the national samples, independent of the category and the year of sampling, presented medium values bellow the legal standards for the ryegrass seeds commercialization, being, in Brazil, 97% of purity an 70% for germination (Table 2). Although, for the samples of imported cultivars, it was verified large difference comparing to the national samples, once all of them were inside the legal standard for commercialization, as much for the S1 and S2 categories as for the years highlighted.

It is important to highlight that the ryegrass seeds produced in Brazil, generally, present quality problems (Silveira et al., 2018). This fact can happen due to the management used to the seeds production of this specie in Brazil, once that the production is originated from areas destined to pasture and afterwards differed for the seeds harvest (Medeiros & Nabinger, 2001; Szareski et al., 2016; Carvalho et al., 2016b). Besides the low medium performance, the seeds produced with the described management are, as a rule, of low physic and physiologic quality. Lima Junior et al. (2015) emphasize that the physic quality of seeds, just harvested at field, usually is related to the conduction of the production field and with methods and proceedings used at harvest.

Ohlson et al. (2008), and Ohlson et al. (2011), evaluating the quality of ryegrass seeds commercialized in the Paraná state, in the seasons 2005 to 2010, observed that 60 to 83% (seasons 2005, 2006 and 2007) and that 50 to 100% (seasons 2008, 2009 and 2010) of ryegrass samples did not reached the minimum stated for the commercialization in relation to the pure seeds parameter. These same authors also verified that in the years of 2005 and 2006, only 3 to 18% of lots, respectively, presented germination within the legal standards for seeds commercialization.

Evaluating the quality of batches of tetraploid ryegrass seeds, originated from different countries and commercialized in the State of Santa Catarina, Ternus et al. (2017) verified that the batches of tetraploid ryegrass seeds produced in Uruguay and Argentina that were commercialized in Santa Catarina, were within the actual legal standards for the physic purity and germination test. The same behavior was not observed for the batches of tetraploid seeds produced in Brazil, mainly in those from the State of Rio Grande do Sul.

It was also stated that the average of imported cultivars samples did not present seeds from other species in amounts above the recommended standard by the legislation (Table 2), independently of the sampling year and category. However, the samples of national cultivars, in the years 2013 and 2015, presented averages superiors to the values of the actual legislation, in reference of the maximum allowed number of other cultivated species, with problems in the quality in the S2 category, for the year of 2013, and S1 for 2015.

In relation to the number of wild seeds (Table 2), it was observed means out of legal standard only for imported cultivars from the S2 category in the 2014 year; the rest of the sample remained with means within the acceptable values for commercialization. Although, for the number of harmful tolerated seeds, only the samples collected in 2015 form national seeds presented nonconformity, as much for the S1 category as for the S2.

When considering that, in 2015, the average of harmful tolerated seeds found in the sampled batches of ryegrass (category S2) was of 47 seeds, were this counting was realized in the work sample, with 0.06 kg, and being 50 $kg.ha^{-1}$the density of sowing commonly used by the farmers, it is possible to estimate that, with the forage seeds, are distributed approximately 39000 seeds of weed seeds per hectare. In the other hand, this tendency was not verified in imported cultivars in the same period.

It is important to highpoint that the State of Santa Catarina is essentially a consumer of forage seeds, being supplied, mostly, by the State of Rio Grande do Sul, which corresponds to 91% of the commerce of ryegrass (Ternus et al., 2016). Studies of the quality of ryegrass seeds produced in Rio Grande do Sul have shown the low quality of seeds from this commercialization. It is the case related by Holbinget al. (2011), when evaluating the quality of ryegrass seeds produced and commercialized in the State of Rio Grande do Sul, which verified that the seeds lots presented low physiologic quality and did not attend the legal standards of purity for commercialization.

At the Table 3, it is possible to observe that, in 2013, it was collected 32 samples of black oat grass, being 100% category S2. Moreover, in the year of 2013, the average of samples from black oat seeds stayed within the legal standards for seeds commercialization in relation to purity, germination, number of wild seeds and tolerate harmful. Although, the average of evaluated samples in relation to the number of seeds from other cultivated species, which is, at maximum, 20 seeds per sample for the category S2 (Brasil, 2005). In this attribute, the main inconformity found was the elevated number of ryegrass seeds blended with black oat grass seeds.

Table 3. Mean values from the quality of seeds samples from the inspection of theblack oat grass commerce in the state of Santa Catarina, years of 2013, 2014 and 2015

Year	Cat.	Nº of Samples	Purity (%)	Germination (%)	Nº OCS	Nº WS	Nº HT
2013	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	0	-	-	-	-	-
	S2	32	97.5±1.5*	81±9	590±391	1±1	11±11
2014	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	8	99.1±0.4	87±4	134±106	7±6	5±4
	S2	32	98.3±1.0	81±8	344±252	10±9	21±20
2015	C1	0	-	-	-	-	-
	C2	1	99.5	91	11	7	2
	S1	21	99.1±0.4	82±7	163±127	11±10	6±6
	S2	112	97.9±1.3	80±6	344±282	28±26	9±8

Note. OCS: Seeds of other cultivated species; WS: Seeds ofwild species; HT: Seeds ofharmful tolerated species. *Standard Deviation.

It is worth to emphasize that the determination of other seeds per number aims to make an estimate of the number of seeds of plants considered harmful by law, present in the sample of analyzed seeds (ISTA, 2007).

In the year of 2014, it was collected 40 samples of black oat seeds (*Avena strigosa* Schreb) (Table 3), being 8 samples from the category S1 and 32 from the S2 category. It was observed, as well, increase of 25% in the number of collected samples between the years of 2013 and 2014 (Table 4). The seed samples of this specie from S1 and S2 categories, collected in the year of 2014, presented means inside the conformity standards for the seeds commercialization for the criteria of purity, germination and number of wild seeds (Table 3). However, the means of the samples for number of seeds of other cultivated species, as much for the category S1 as for S2, stood above the limit preconized by the legal standards for this specie. In the same manner, while related to the number of harmful tolerated seeds, the samples means of the category S2, in 2014, presented above the maximum limit determined by law so a black oat seeds batch can be commercialized.

Differently from the 2013 and 2014 years, in the year of 2015 it was collected 134 samples of black oat seeds (Table 3), being collected 102 and 94 samples more sample than the 2013 and 2014 years, respectively. Inside the 134 collected samples, only one belonged to C2 category, 21 for S1 category and 112 to the S2 category. It was possible to observe that the seeds belonging to the C2 category presented satisfactory values for all the quality criteria evaluated, although, the sample means from the S1 category stayed below the standard in relation to number of seeds from other cultivated species being, repeatedly, the blending with ryegrass seeds the main cause of this inconformity. In the other hand, the sample of S2 seeds presented complications in relation to the number of seeds from other cultivated species and wild seeds.

In this context, considering that in 2014 the average of harmful tolerated seeds detected in the black oat lots, of the S2 category, was 21 seeds, being this counting realized in the work sample with 0.5 kg and that the sowing density commonly used by farmers is 60 kg ha^{-1}, it is possible to estimate that, within the seeds of forage species, are distributed, approximately, 2500 weed seeds per hectare. It was noticed that, for the S1 category, in the 2014 year, the number of seeds from harmful tolerated seeds was 75% lower in relation to that detected in S2 category. The sample of black oat seeds collected in the year of 2015 (Table 3) demonstrated how important is the use of certified seeds for the maintenance of quality from materials to be commercialized. Carraro (2001) instated that as much higher the use of certified seeds, the higher the productive will be among the years.

For the oat (*Avena sativa*) seeds (Table 4), it was collected 41 samples, being 7 originated from the year of 2013, 10 from 2014 and 24 samples from the year of 2015. Among the 41 samples, 39 (95.1%) belonged to S1 or S2 categories, being that in the 2013 and 2014 years, all the collected samples were S2 category, although, for the 2015 year, among 24 collected samples, only one belonged to C2 category, 3 to S1 and 20 (83.3%) to S2 category.

In the years of 2013 and 2014, it was verified that the samples means of oat seeds were below the maximum limit required by law for the seeds commercialization, as much for the criteria number of seeds from other cultivated species and harmful tolerated (Table 4). In this case, the counting is realized in the work sample with 1.0 kg and considered the sowing density of 60 kg ha^{-1}, so the consumer would be taking to the field, approximately, 800 weed seeds with the forage category S2. On the other hand, for the samples of oat seeds, collected in the year of 2015 (Table 4), it was verified that the mean of S2 seeds samples, for the criteria of germination and number of other cultivated species, in the C2, S1 and S2 categories, presented medium mean values inferior and superior, respectively, in relation to the preconized by the legal standard of seeds commercialization. For this specie, the presence of black oat seeds in the lots, characterized 95% of the unconformities checked during the evaluation period.

Table 4. Mean values of the quality of seeds samples from the inspections of the commercialization ofoatin the state of Santa Catarina, in the years of 2013, 2014 and 2015

Year	Cat.	Nº of samples	Purity (%)	Germination (%)	Nº OCS	Nº WS	Nº HT
2013	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	0	-	-	-	-	-
	S2	7	99.3±0.3*	86±6	68±58	0	12±10
2014	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	0	-	-	-	-	-
	S2	10	98.6±1.1	83±6	129 ±119	0	14±13
2015	C1	0	-	-	-	-	-
	C2	1	99.9	80	3	0	0
	S1	3	99.3±0.3	82±5	20±13	0	8±6
	S2	20	99.1±1.0	77±9	48±44	2±2	4±4

Note. OCS: Seeds ofother cultivated species; WS: Seeds ofwild species; HT: Seeds of harmful tolerated species. *Standard Deviation.

Among the 2013 and 2015 years, it was collected 312 samples of sudangrass (*Sorghum sudanense*) seeds in the state of Santa Catarina (Table 5). It was verified one sample of C1 category, 17 from C2 category, 24 of S1 category and 270 from S2 category. In the year of 2013, it was collected 61 samples, being the larger amount (92%) belonging to the S2 category. However, for the year 2014, there was a significant increase in the number of samples collected in relation to the year of 2013, totalizing 143 samples (2015). In the year of 2015, it were collected 108 samples, what is a decrease of 35 samples in relation to the year of 2014.

Table 5. Mean values of the quality of seeds samples from the inspections of the commercialization of sudangrassin the state of Santa Catarina, in the years of 2013, 2014 and 2015

Year	Cat.	Nº of samples	Purity (%)	Germ. (%)	Nº OCS	Nº WS	Nº HT
2013	C1	1	98.7	74	15	0	0
	C2	0	-	-	-	-	-
	S1	4	95.3±4.3*	69±6	111±106	7±2	28±22
	S2	56	97.5±1.9	69±9	147±138	7±7	9±9
2014	C1	0	-	-	-	-	-
	C2	14	97.2±0.9	70±5	20±16	2±3	7±1
	S1	9	99.1±0.9	73±8	13±10	0	15±11
	S2	120	96.6±2.1	58±16	53±49	5±1	15±12
2015	C1	0	-	-	-	-	-
	C2	3	99.5±0.3	71±1	0	0	0
	S1	11	98.9±0.8	74±9	17±13	0	3±5
	S2	94	98.3±1.4	70±11	51±48	35±17	5±1

Note. Germ: Germination; OCS: Seeds of other cultivated species; WS: Seeds of wild species; HT: Seeds of harmful tolerated species. *Standard Deviation.

The main unconformity was observed for the number of other cultivated species, for the S1 and S2 categories in the year of 2013. The mean of every batch evidenced values above the maximum limit allowed. In this context, the blending of millet (*Pennisetum glaucum* L.) seeds was the main factor for this irregularity, being 80% superior from seeds of other cultivated species detected. Taking as a base the sampled batches in 2013, form the S1 category, and taking into account that this counting was realized in the work sample with 0.25 kg and sowing density of 50 kg ha^{-1}, it is estimated that the purchases will be taking to the field, approximately, 22000 seeds of other cultivated species, 1400 wild seeds and 5600 harmful tolerated weed seeds. The elevated number of pearl

millet in the sudangrass samples can be direct related with the issues in relation to the cleaning of benefiting equipment of the seeds benefiting unity (UBS), besides the lack of care in the management of the seeds production fields.

For the years of 2014 and 2015 it was evidenced a gradual improvement in this criteria. It was not observed, during the studied period, a single batch of sudangrass with number of wild seeds above the maximum allowed limit (Table 5). In relation to the number of harmful tolerated seeds, it was only observed non-conformity in lots of the category S1, analyzed in 2013. In the other hand, for the mean values of the pure seeds parameter, it was verified non-conformity in the S1 and S2 categories in the years of 2013 and 2014. In relation to the germination mean, it was shown non-conformity in the lots of the S2 category sampled in 2014 (Table 5).

For pearl millet seeds, it was collected 58 samples in the year of 2013, 53 in the year of 2014 and 92 in 2015, configuring an increase in the collections number of 74% in relation to the 2013 to 2015 years.Within the 193 collected samples between the years of 2013 to 2015, only two samples belonged to C2 category, the rest of the samples varied between S1 and S2 categories (Table 6). The results of quality presented for the lots of millet seeds (Table 6) diverge from what was presented for the lots of sudangrass seeds. The means capable of disapproval for the lots of millet seeds were observed only for the parameters of germination and purity, independently of the category and sampling year. It reinforces a report by Almeida et al. (2007), when described that the main determining factors of the low quality of forage seeds are the physic purity and germination.

In relation to the purity (Table 6), the samples from the C2 category collected in the 2014 year, andthe S1 collected in 2013, showed values below the average preconized by law for the commercialization of millet seeds. For germination, only the samples of C2 category from the year of 2014 obtained means below the minimum average. It is important to highlight that, in this case, both samplings occurred in batches that was inside the expiration date, although, in its last month. Either way, the results presented for millet seeds in this study are similar to those found by Ohlsni et al. (2010), when realizing a data collection about the physical and physiological quality of seeds commercialized in the state of Paraná, in the season of 2006 to 2008. They observed that most of the analyzed samples, in the three studied seasons, presented within the standard for commercialization of seeds from this specie in relation to the percentage of pure seeds and germination. It is worth to emphasize that the state of Paraná is a forthright supplier of many forage seeds to the state of Santa Catarina, being part of the millet samples, collected by the state of Santa Catarina, originated from seed farmers of Paraná.

Table 6. Mean values of the quality of seeds samples from the inspections of the commercialization of pearl millet in the state of Santa Catarina, in the years of 2013, 2014 and 2015

Year	Cat.	Nº of samples	Purity (%)	Germination (%)	Nº OCS	Nº WS	Nº HT
2013	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	2	95.6±3.1*	75±8	1±1	15±7	12±1
	S2	46	97.8±1.4	79±10	1±1	12±11	11±10
2014	C1	0	-	-	-	-	-
	C2	2	93.4±0.9	67±5	0	0	0
	S1	3	97.3±3.3	76±9	1±1	0	0
	S2	48	97.5±2.1	78±8	3±2	1±1	1±1
2015	C1	0	-	-	-	-	-
	C2	0	-	-	-	-	-
	S1	6	99.2±0.7	82±7	0	0	1±1
	S2	86	97.3±2.1	78±8	3±2	1±1	1±1

Note. OCS: Seeds of other cultivated species; WS: Seeds of wild species; HT: Seeds of harmful tolerated species. *Standard Deviation.

In a study about the quality of forage seeds commercialized in Brazil, Almeida et al. (2007) revealed that more than 60% of the evaluated samples were below the minimum quality standards required by law. Also, from the moment that the CIDASC, responsible body for the execution of CEQ in Santa Catarina, takes into account the result of the sampled lot, thru the BASO, and verifies irregularities, it initiate a new phase in the inspection

process. In cases where the minimum indexes pre-established in the legal standards of the species are not met, the seeds lot must have its commercialization suspended (Brasil, 2004). In this case, the FEA returns to the commercial establishment, where the sample was collected, and if there is still seeds from the sampled lot, these are promptly seized. After the administrative process, the seeds, in the forage case, with the exception to oat (which if submitted to disintegration process, can be destined to feed), are destined for destruction, generally by incineration or buried. It is emphasized that all the costsdue to this procedure are the seeds holder cost (Santa Catarina, 2009). In addition, it is necessary to explain that, lots that present non-conformities in relation to mixes with other seeds can be beneficiated again, since this operation occurs in UBS accredited by the MAPA in Santa Catarina.

This scenario verified with the forage seeds during the analyzed period demonstrates the fragility of the CIQ from seeds companies. That is said because, according to Baudet and Peske (2006), the CIQ executed by the company has the basic premise of achieving the minimum standards established by the government, besides pursuing restricted standards to get maximum satisfaction from the users of its seeds.

In this manner, it is necessary the evolution of the quality control in the seeds production in Brasil, mostly forage seeds, which in the national picture, suffers with serious problems of quality in its commercialization. Given the above, Ternus et al. (2016) cite the main pathways in order to remedy such problems, based in the enhancement of the Brazilian legislation on production, laboratorial analysis and commercialization of high quality seeds, as well, new production technics developed by the public and private research and maintaining the important external quality control.

4. Conclusion

Lots of forage seeds sampled in the state of Santa Catarina in the year of 2013 to 2015, presented low physiologic and physic quality, being the main criteria of disapproval the physic purity and germination.

The samples of forage seeds from C1 and C2 categories collected in Santa Catarina present superior quality in relation to the non-certified S1 and S2.

The quality of ryegrass seeds (national) showed below the legal standards established, independent of the year, for the physic purity and germination criteria. Although, for the ryegrass lots (imported) there was none disapproval related to germination and physic purity being out of the tolerated limits.

The germination and physic purity indexes, for sudangrass lots presented conformity index adequate to the tolerated limits allowed by legal standards. In the other hand, for the same species, the criteria for number of other cultivated species presented 100% of disapproval for the analyzed lots in the non-certified categories in 2013.

Lots of pearl millet seeds, with exception of those from the C2 category sampled in 2014, presented in conformity to the legal standards required, being, in comparison with the other species, the one that showed lower non-conformity degree in the analyzed period.

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