Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 06, pp.52324-52328, June, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

FORAGE SUPPLY, LITTER DEPOSITION AND LEAF/STEM RATIO IN RYEGRASS PASTURE MANAGED AT DIFFERENT HEIGHTS

[1]Leonardo Ereno Tadielo, [1]Priscila Cristine Carraro, [1]Tainara Bremm, [1]Nathaly Lopes Toledo dos Santos, [1]Diego Corazza, [1]Marinara Macelai, [2]Deise Dalazen Castagnara and [3]Rodrigo HolzKrolow

[1]Universidade Federal do Pampa – Unipampa, Campus Uruguaiana, Under Graduate Student of Veterinary Medicine. BR 472, Km 592, Caixa Postal 118, CEP: 97500-970, Uruguaiana, RS
[2]Universidade Federal do Pampa – Unipampa, Campus Uruguaiana, Zootechnician, Dr.ª Prof.ª ofVeterinary Medicine
[3]Universidade Federal do Pampa – Unipampa, Campus Uruguaiana, Agronomist, Dr. Prof. of Veterinary Medicine

ARTICLE INFO

Article History:
Received 07th March, 2017
Received in revised form
16th April, 2017
Accepted 29th May, 2017
Published online 20th June, 2017

Key words:
Animal performance,
Dry matter,
Sheep.

ABSTRACT

The objective of this work was to determine the structural components and the forage supply in ryegrass pastures managed at different heights. A randomized block design with four grazing heights (5, 10, 15, and 20 cm) and one with the absence of grazing (30 cm) was adopted. Four repetitions were carried out, totaling 20 experimental units. Sixty days after the emergence of ryegrass cv. Estanzuela 284, grazing began with the use of four sheep testers, grazing for 45 days. Subsequently the sampling was performed, and the material was separated into fractions of dead material, leaves and stems+ sheaths. Dry matter production increased linearly in response to grazing heights with an increase of 399.76 kg ha^{-1} for each centimeter increase in pasture management height. However, the increase in management heights also caused a linear increase in litter deposition. For each centimeter of increase in the management height, a deposition of 62.96 kg ha^{-1} of litter was verified. The leaf/stem ratio presented a quadratic behavior in response to the increase in pasture management heights, so that the lowest leaf/stem ratio was observed at the estimated grazing height of 15.6 cm. The study showed that the higher the pasture height, the higher the dry matter yield, the greater the availability of forage, and consequently the better the animal performance.

Citation: Leonardo Ereno Tadielo, Priscila Cristine Carraro, Tainara Bremm, Nathaly Lopes Toledo dos Santos, Diego Corazza, Marinara Macelai, Deise Dalazen Castagnara and Rodrigo HolzKrolow, 2017. "Forage supply, litter deposition and leaf/stem ratio in ryegrass pasture managed at different heights", *International Journal of Current Research*, 9, (06), 52324-52328.

INTRODUCTION

A major focus of the scientific community has been directed towards the sustainable use of natural resources, especially soil and water, since the maintenance of the quality of these resources is essential for the growth and development of plants and the sustainability of agricultural systems (Araujo *et al*., 2010). In this context, studies involving pasture management in systems under grazing become relevant, especially in the sense of preventing erroneous practices such as overgrazing (Nabinger *et al*., 2009). In the case of grazing management, the forage mass can be spatially arranged in an infinite form of combinations of height and volume density, influencing the quantity and quality of forage ingested by the animal (Carvalho *et al*., 2001). Thus, the importance of evaluations that allow a better understanding of the pasture structure's formation is evidenced by the fact that the same forage mass can be obtained with different heights and / or structures and vice versa. According to Rocha *et al* (2007), the quantification of the proportion of plant components, especially the leaf/stem ratio, is important in the comparison between cultivars and forageablespecies, since they can affect the weight gain of grazing animals. The ryegrass (*Loliummultiflorum* Lam.) is a hibernal grass, which stands out becauseofits high nutritional value and forage production during the cold period of the year, being cultivated in all of the southern region of Brazil, in addition to being recommended as a winter-spring grass (Carvalho *et al*., 2010). In sheep raising, its use has been indicated to correct the losses caused by forage seasonality, and is recommended for the termination of young sheep, mainly in the annual breeding season, with labor during

****Corresponding author: Leonardo Ereno Tadielo***
Universidade Federal do Pampa – Unipampa, Campus Uruguaiana, Under Graduate Student of Veterinary Medicine. BR 472, Km 592, Caixa Postal 118, CEP: 97500-970, Uruguaiana, RS

winter/spring (Ribeiro *et al*., 2009). However, its use basically comprises the direct grazing without any application of suitable pasture management techniques, which could provide an optimization of structural components of the pasture that allow greater animal gain. Managing pasture at lower heights, while reducing leaf/stem ratio, may also reduce the supply of forage to animals. In the case of ryegrass used for sheep grazing, the recommended values of grazing heights are not yet consolidated, and there is a need for further studies to determine the change in the structural components of this pasture as a function of height management (Confortin *et al*., 2013). Therefore, the objective of this work was to determine the structural components and the supply of forage in ryegrass pastures managed at different heights.

MATERIAL AND METHODS

The study was carried out at the school's farm (*Fazenda Escola)* and at the Horticulture Sector of *Universidade Federal do Pampa* – at *Uruguaiana* Campus. A randomized block design with four grazing heights was adopted: 5; 10; 15 and 20 cm; and one with the absence of grazing (30 cm). Four repetitions were carried out, totaling 20 experimental units. The ryegrass cv. Estanzuela 284 was sown on May 10, 2013 in the no-till farming system after desiccation of the area with herbicide and the aid of a continuous-flow planter, using a density of 25 kg of viable pure seeds per hectare, with seed quantity corrected as a function of its cultural value, together with 288 kg ha^{-1} of NPK fertilizer (formulation 04-17-27). The soil of the area is classified as HaplicPlintosoil(Embrapa, 2006) and presented characteristics determined by means of soil analysis: pH in water – 6.21; P (Mehlich) – 9.35 mg/dm^3; K (Mehlich) – 0.24 $cmol_c$ / dm^3; Ca^{2+} (KCl 1 mol/L^1) – 7.96 $cmol_c/dm^3$; Mg^{2+} (KCl1 mol/L) – 4.90 $cmol_c/dm^3$; Al^{3+} (KCl 1 mol/L) – 0.00 $cmol_c/dm^3$; H+Al (calcium acetate 0.5 mol/L) – 2.32 $cmol_c/dm^3$; sum of the bases–13.10 $cmol_c/dm^3$; CEC – 15.42 cmol/dm^3; V – 84.95%, organic matter (Boyocus Method) – 23.24 g/dm^3; sand – 437.40 g/kg; silt –341.60 g/kg and clay – 221.00 g/kg.

At 60 days after the emergence of the plants, grazing began with the use of Criollobreed testsheep in picket fences, in the continuous grazing system, besides the use of regulating animals to maintain the desired height of the pasture. The grazing height was measured daily using a ruler during the 45 days of the grazing period. After the animals were removed from the pasture area, a metal square with a known area (0.25 m^2) was sampled and randomly launched twice in each experimental unit. All the material contained in the interior was collected by cutting the plants at ground level. In the laboratory, the separation of the sampled botanical material was carried out to obtain its composition. The material was separated into the following categories: dead material, leaves and stems + sheaths. After separation, the samples were submitted to oven drying with forced air circulation for 72 hours at 55°C. The dry matter (DM) production values were expressed in kg ha^{-1}. The dead material was considered to be the litter deposited, while the leaf/stem ratio was obtained from the ratio between the dry weight of leaves and the dry weight of stem. The available dry matter was considered as the sum of leaves and stem+ leaf sheaths. The data was submitted to variance analysis and the means were compared using regression analysis by testing the linear and quadratic models. The highest significance level and the highest coefficient of determination were used to choose the model (Pimentel-Gomes, 2009).

RESULTS AND DISCUSSION

There were significant differences in thedry matter production, litter deposited and leaf/stem ratio depending on the pasture management heights. The dry matter yield increased linearly in response to grazing heights (Figure 1), with an increase of 399.76 kg ha^{-1} for each centimeter increase in pasture management height. This result is desirable for the performance of the animals because the greater the availability of forage, the greater the opportunity to select the most nutritive fractions of the pasture and the better the animal performance. However, when there is excessive supply of forage, losses occur due to the aging of the forage, which causes an increase in the content of Neutral Detergent Fiber (NDF) due to the reduction of cellular content and increase of the cell wall in the plant cell. The increase in NDF contents may limit dry matter intake due to the filling effect, triggering the reduction in forage digestibility and in animal performance. At the same time, as the age of forages increases, there is also an increase in lignin content in the forage offered to the animals, which has negative correlation with forage digestibility and ruminant diet (Van Soest, 1994). The study of the effects of grazing heights on a forage supply in hibernal pastures is relevant because,due to the defoliation of plants, grazing heights determine the dry mass of forage produced and offered by the pasture (Aguinaga *et al*., 2008). The forage supplies observed in the studied treatments can be considered satisfactory because they were similar to results from previous studies (Primavesi *et al*., 2002; Bortolini *et al*., 2004; Moreira *et al*., 2007; Cassol *et al*., 2011).

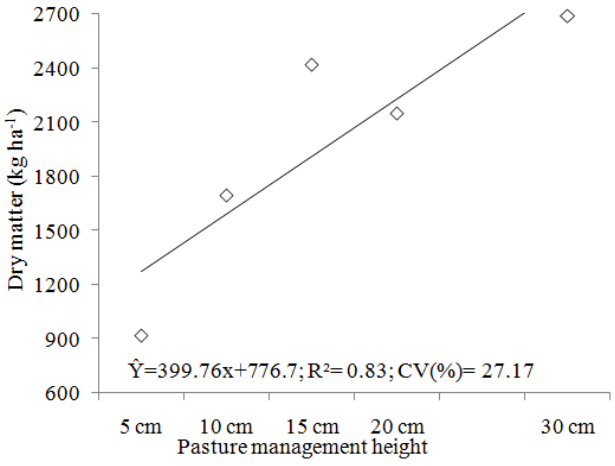

Figure 1. Dry matter forage supply in ryegrass pasture managed at increasing heights

The increase in management heights also led to a linear increase in litter deposition, characterized by the dead material from the natural senescence of the pasture or the losses caused by trampling during grazing. For each centimeter of increase in the management height, a deposition of 62.96 kg ha^{-1} of litter was verified. This increase can be justified by the lower intensity of forage harvest by the animals during grazing, which provided a higher rate of leaf senescence in the ryegrass pasture. The greater opportunity of selection caused by the greater availability of forage contributed to a greater movement of the animals during the selection process,

increasing the intensity of trampling and death of leaves and tiller, which contributed more to the composition of the deposited litter. Also, with the highest grazing height, the forage harvest was less efficient, favoring the senescence of the lower insertion leaves in the tillers. The senescence of these leaves is due to the foliar renewal that naturally occurs in the plants, the absence of light capture and the translocation of photoassimilates for the appearance of new leaves. This last process becomes even more evident when the plants reach the reproductive stage and the photosassilates are translocated to form the reproductive structures and later to formgrains (Castagnara *et al*., 2010). According to Carvalho *et al* (2010), with the course of grazing, the unevenness of the forage harvest heightbecomes pronounced, which also contributes to a greater deposition of litter.

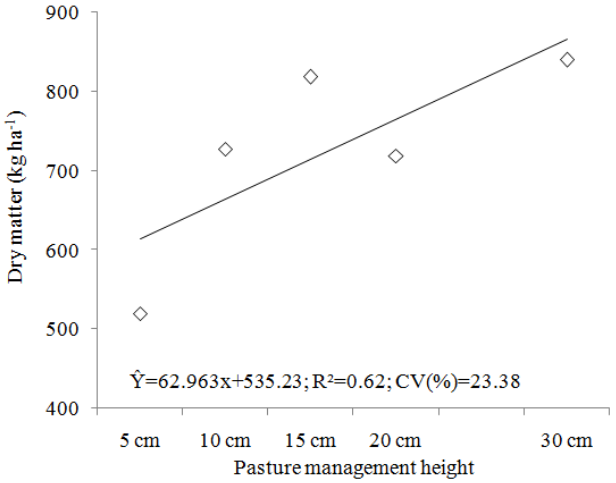

Figure 2. Dry matter litter deposited in ryegrass pasture managed at increasing heights

The leaf/stem ratio showed a quadratic behavior in response to the increase in pasture management heights, so that the lowest leaf/stem ratio was observed at grazing height estimated at 15.6 cm (Figure 3). According to Langer (1979), changes in leaf/stem ratio observed in pastures may be due to the stretching between nodes with the arrival of the reproductive phase (Langer, 1979). Niklas (1994) points out that in pastures, the proportion of stems increases proportionally to the weight of the leaves, due to the sustentation function of these stems. In the present study, where the lowest leaf/stem ratio was observed at the height of15.6 cm, stems were developed, but leaves were constantly harvested by grazing animals. Atshorter heights, even the development of the stems was limited, whereas in the upper heights, due to the lower grazing intensity, it was possible to express leaf development, in greater proportion in relation to the stems, providing a pasture with a higher leaf/stem ratio. In a study carried out by Skonieski *et al* (2011), there was a higher production of stems with respect to leaves at 41 and 35 days respectively. Thisis an important parameter to define the moment of entry of the animals in the pastures, since the beginning of the reproductive stage ceases the emission of leaves and defines forage production, with NDF values between 50 and 55%. The increase in grazing heights caused a linear increase in pasture straw deposition capacity (Figure 4). For each centimeter increase in pasture management height, there was an increase of 73 kg ha^{-1} of dry mass that would be deposited on the soil surface if the pasture was desiccatedfor implantation of a crop under the no-tillfarming system. The study of hibernal forages in integrated agricultural production systems is relevant because they can overcome the deficiencies occurring during the periods of scarcity with forage of high nutritional value (Aguinaga *et al*., 2008; Carvalho *et al*., 2010; Mondardo *et al*., 2010), provide plant cover (Cassol *et al*., 2011) and contribute to the production systems sustainability over the time (Pin *et al*., 2011).

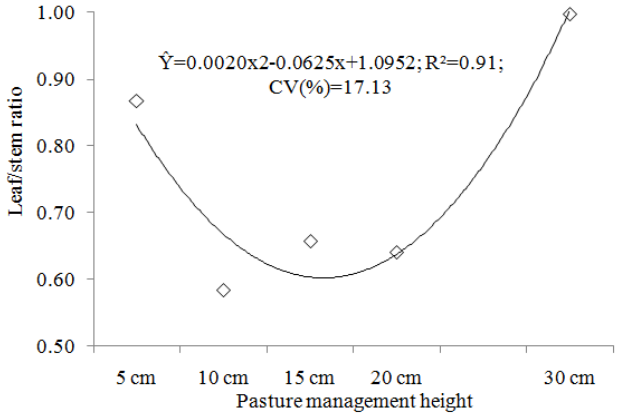

Figure 3. Leaf/stem ratio in ryegrass pasture managed at increasing heights

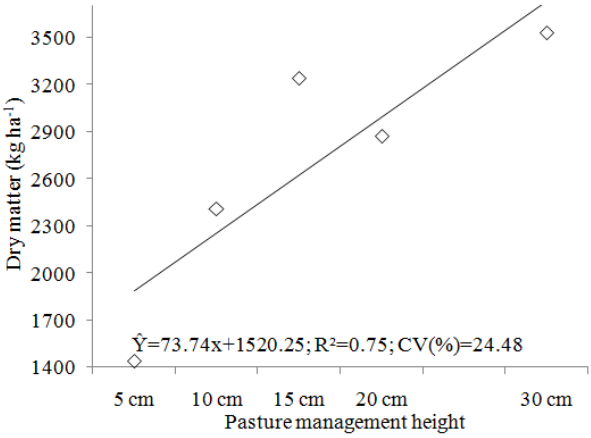

Figure 4. Deposition of straw dry matter to cover the ground in ryegrass pasture managed at increasing heights

However, in this production system, several factors such as plant, soil, climate and animals interfere with the growth of plants (Aguinaga *et al*., 2008; Carvalho *et al*., 2010), altering their development and pasture productivity (Skonieski *et al*., 2011). The grazing height determines the dry matter of residual straw produced by the defoliation carried out by the animals (Aguinaga *et al*., 2008). With the exception of the management height of 5 cm, all heights provided a satisfactory soil cover because at the estimated height of 6.5 cm the residual straw deposition of 2000 kg ha^{-1}, recommended by Assmann and Pin (2008), was achieved. According to the authors, in integrated systems located in subtropical regions, there is a need for a minimum amount of 2000 kg ha^{-1} of straw for the implantation of the summer crop in succession to the hibernal forages in the no-tilfarming system. In integrated production systems, with livestock and agriculture interacting in the same space, besides improving physical attributes through the presence of the forage plant and contributing to soil conservation (Aguinaga *et al*., 2008), pasture management and grain crops in an integrated mannerprovides a glimpse of the sustainability of

productive systems that would not be achieved if the activities were conducted separately (Pin *et al*., 2011). For this reason, the measurement of residual straw deposition becomes relevant, since in this system there is the effect of the animal (Baggio *et al*., 2009).By means of the grazing intensity, it is possible to determine the animal production, the soil conditions and the quantity of straw that is transferred to the agricultural phase (Carvalho *et al*., 2005), since the post-grazing residue heights adopted for pasture management determine the total amount of dry matter produced and the magnitude of the impact of animal trampling (Aguinaga *et al*., 2008). The residual straw deposited on the soil surface, besides guaranteeing soil conservation against erosive processes, also contributes to prevent compaction caused by animal trampling. The damping effect provided by the vegetation cover on the soil surface dampens the contact of the animals' feet with soil, reducing the risks of increasing the density. When compaction is evidenced by increased soil density, the presence of straw on the surface provides a recovery mechanism to the initial soil density due to the incorporation of the organic matter fromthe decomposition of the plant material. Indirectly, and through the decomposition of organic matter, the surface cover of the soil with plant material also provides improvement in soil fertility and water availability for plants, culminating in an increase in productivity.

Conclusion

The increase in the management height of ryegrass pastures increases the supply of forage to the animals; however, it provides greater losses of forage due to the deposition of litter. Under the conditions of this work, grazing heights higher than 6.5 cm provide residual straw deposition higher than 2000 kg ha^{-1}.

REFERENCES

Aguinaga, A. A. Q.; Carvalho, P. C. F.; Anghinoni, I.; PILAU, A.; Aguinaga,A. J. Q.; Gianluppi,G. D. F.Componentes morfológicos e produção de forragem de pastagem de aveia e azevém manejada em diferentes alturas. Revista Brasileira de Zootecnia, Viçosa, v. 37, n. 9, p. 1523-1530, 2008.

Araujo, F.S.; Salviano, A.A.C.; Leite, L.F.C.; Souza, Z.M.; SOUZA, C.M. Physicalqualityof a yellowlatos solunderintegratedcrop-livestock system. Revista Brasileira de Ciência do Solo, Viçosa, v.34, n.3, p.717-723, 2010.

ASSMANN, A.L.; PIN, E.A. Manejo de biomassa. In: SOARES, A.B.; ASSMANN, T.S.; ASSMANN, A.L. Integração Lavoura-Pecuária para a agricultura familiar. Instituto Agronômico do Paraná – IAPAR. Londrina, 2008. p. 11-14.

Baggio, C.; Carvalho, P.C.F.; Silva, J.L.S.; Anghinoni, I.; Lopes, M.L.T.; Thurow, J.M.Padrões de deslocamento e captura de forragem por novilhos em pastagem de azevém-anual e aveia-preta manejada sob diferentes alturas em sistema de integração lavoura-pecuária. Revista Brasileira de Zootecnia, Viçosa, v.38, n.2, p.215-222, 2009.

Bortolini, P. C.; SANDINI, I.; CARVALHO, P. C. F.; MORAES, A. Cereais de inverno submetidos ao corte no sistema de duplo propósito.Revista Brasileira de Zootecnia, Viçosa, v. 33, n.1, p. 45-50, 2004.

CARVALHO, P. C. DE F.; ANGHINONI, I.; MORAES, A.; TREIN, C. R.; FLORES, J. P. C.L; CEPIK, C. T.C.; LEVIEN, R.; LOPES, M. T.; BAGGIO, C.; LANG, C. R; SULC, R. M.; PELISSARI, A.O estado da arte em integração lavoura-pecuária. In: GOTTSCHALL C.S.; SILVA, J.L.S.; RODRIGUES, N.C. (Eds.). Produção animal: mitos, pesquisa e adoção de tecnologia. Canoas: Editora da ULBRA, p.7-44, 2005.

CARVALHO, P. C. F.; ROCHA, L. M.; BAGGIO, C.; MACARI, S.; KUNRATH, T. R.; MORAES, A. Característica produtiva e estrutural de pastos mistos de aveia e azevém manejados em quatro alturas sob lotação contínua.Revista Brasileira de Zootecnia, Viçosa, v. 39, n.9, pp. 1857-1865, 2010.

Cassol, L. C.; Piva, J. T.; Soares, A. B.; Assmann, A. L. Produtividade e composição estrutural de aveia e azevém submetidos a épocas de corte e adubação nitrogenada.Revista Ceres, Viçosa, v. 58, n.4, p. 438-443, 2011.

Castagnara, D.D.; Radis, A.C.; Souza, L.C.; Souza, F. H.; Neres, M. A.; Mesquita, E. E. Características estruturais e produtivas da aveia preta comum em cinco idades de rebrota na região Oeste do Paraná. Cultivando o Saber, Cascavel, v.3, n.2, p.116-129, 2010.

Confortin, A. C. C.; Rocha, M. G.; Quadros, F. L. F.; Glienke, C. L.; Rossi, G. E.; Moraes, A. B. StructuralandmorphogenicalcharacteristicsofblackoatsandItalianryegrassonpasturesubmittedtotwograzingintensities.Revista Brasileira de Zootecnia, Viçosa, v. 39, n.11, p. 2357-2365, 2010.

Costa, O.A.D.; Meinerz, G.R.Composição botânica e estrutural e valor nutricional depastagens de azevém consorciadas. Revista Brasileira de Zootecnia, Viçosa, v.40, n.3, p.550-556, 2011.

Goes, R. H. T. B.; Mancio, A. B.; LANA, R. P.; Valadares Filho, S. C.; Cecon, P. R.; Queiroz, A. C.; Costa, R. M. Avaliação qualitativa da pastagem de capim Tanner-Grass (*Brachiaria arrecta*), por três diferentes métodos de amostragem. Revista Brasileira de Zootecnia, Viçosa, v.32, p.64-69, 2003.

Langer, R.H.M. How grasses grow. 2.ed. London: Edward Arnold, 1979. 66p.

Mondardo, D.; Castagnara, D. D.; Oliveira, P. S. R.; ZOZ, T.; MESQUITA, E. E. Produção e composição químico-bromatológica da aveia preta fertilizada com doses crescentes de dejeto líquido suíno.Revista Ciência Agronômica, Fortaleza, v. 42, n. 2, p.509-517, 2011.

Moraes, E. H. B. K.; Paulino, M. F.; Zervoudakis, J. T.; Valarades Filho, S. C.; Moraes, K. A. K. Avaliação qualitativa da pastagem diferida de *Brachiariadecumbens* Stapf., sob pastejo, no período da seca, por intermédio de três métodos de amostragem. Revista Brasileira de Zootecnia, Viçosa, v.34, p.30-35, 2005.

Moreira, A. L.; Reis, R. A.; Ruggieri, A. C.; Saran Junior, A. J. Avaliação de forrageiras de inverno irrigadas sob pastejo.Ciência e Agrotecnologia, Lavras, v.31, n.6, p.1838-1844, 2007.

Nabinger, C., Ferreira, E.T., Freitas, A.K., Carvalho, P.C.F., Sant'Anna, Menezes, D., *et al*., 2009. Produção Animal com base no campo nativo: aplicação de resultados de pesquisa. In: Pillar, V.P. (Ed.), Campos Sulinos—conservação e uso sustentável da biodiversidade. Ministério do MeioAmbiente, Brasil, pp. 175–198, Available at: http://ecoqua.ecologia.ufrgs.br/arquivos/Livros/CamposSulinos.pdf (Accessed in February 2017).

Niklas, K. J. *Plant allometry:* the scaling process. Chicago: University of Chicago Press; Chicago: Illinois, USA, 1994.

Pimentel-Gomes, F. P. Curso de Estatística Experimental.15ª Ed., Fealq, Piracicaba.2009.451p.

Pin, E.A.; Soares, A.B.; Possenti, J.C.; Ferrazza, J.M. Forage production dynamics of winter annual grasses sown on different dates. Revista Brasileira de Zootecnia, Viçosa, v.40, n.3, p. 509-517, 2011.

Privavesi, A. C.; Primavesi, O.; Cantarella, H.; Godoy, R.; Vivaldi, L. J. Adubação de aveia em dois sistemas de plantio. Pesquisa Agropecuária Brasileira, Brasília, v.37, n.12, p. 1773-1778, 2002.

Primavesi, A.C.; Primavesi, O.; Cantarella, H.; Godoy, R.; Vivaldi, L. J. Ribeiro, T. M. D.; Monteiro, A. L. G.; Poli, C. H. E. C.; Moraes, A.; Silva, A. L. P.; Barros, C. S. Características da pastagem de azevém e produtividade de cordeiros em pastejo. Revista Brasileira de Zootecnia, Viçosa, v.38, n.3, p. 580-587, 2009.

Rocha, M. G.; Quadros, F. L. F; Glienke, C. L.; Confortin, A. C. C.; Costa, V. G.; Rossi, G. E. Avaliação de espécies forrageiras de inverno na Depressão Central do Rio Grande do Sul. Revista Brasileira de Zootecnia, Viçosa, v.36, n.6, p.1990-1999, 2007.

Silveira, V. C. P.; Vargas, A. F. C.; Oliveira, J. O. R.; Gomes, K. E.; Motta, A. F. Qualidade da pastagem nativa obtida por diferentes métodos de amostragem e em diferentes solos na Apa do Ibirapuitã, Brasil. Ciência Rural, Santa Maria, v.35, n.3, p.582-588, 2005.

Skonieski, F. R.; Viégas, J.; Bermudes, R. F.; Nörnberg, J. L.; Ziech, M. F.;Costa, O.A.D.; Meinerz, G.R.Composição botânica e estrutural e valor nutricional depastagens de azevémconsorciadas.Revista Brasileira de Zootecnia, Viçosa, v.40, n.3, p.550-556, 2011.

Van Soest, P.J. Nutritional ecology of the ruminant. Ithaca. Constock Publishing Associates.476 p. 1994.

****