

# Potential of dispersal seeds by endozoochory of *Urochloa decumbens* seed and *Melinis minutiflora* by riding animals

Luciana Yukie Matsubara, University of São Paulo, Brazil, lucianayukie@gmail.com

Teresa Cristina Magro, University of São Paulo, Brazil, teresa.magro@usp.br

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The use of horse riding in natural areas has caused great concern due to social and environmental impacts. One of the problems that has been investigated in some countries is the relationship between the use of riding animals and the presence of exotic plants. This kind of study is very important, once invasive species are the second cause of biological diversity loss. Herbivores are able to disperse a wide variety of species through their feces (JANZEN 1984; Vellend et al 2003). However little is known whether these seeds will be able to grow and settle in places. It is estimated that only a small portion of seeds present in the feces of horses will be established. Therefore, this study aims to verify if seeds of *Urochloa decumbens* and *Melinis minutiflora*, after being eaten and defecated by horses, have the ability to germinate, grow and bear fruit in ideal conditions.

## Background and objectives

Protected Areas that use horses for recreational purposes have been causing polemic amongst managers, planners and developers of equestrian tourism. In Brazil the document - Guidelines for Visitation in Protected Areas - provides such practices with the goal of fostering the local economy through the possibility of hiring animals for riding and transportation of equipment into remote areas.

Authors like Newsome, Cole and Marion (2004) take the position that the use of horses in areas with a high biological value should be prohibited due to the potential risks for conservation of biodiversity. According to Pickering and Hill (2007) damages caused by horses are similar to damages caused by off-road vehicles, beyond conflicts created with other users.

Andrade (2009) studied the use of recreational riding with animals in the Serra do Cipó National Park (Brazilian savanna area). The author took samples of animal feces at two tracks. Across the *in situ* and laboratory experiment, she studied germination of collected material. The findings were inconclusive, with seeds germination occurring only at the laboratory conditions. With *in situ* tests no germination was observed. Amongst other species, the survey identified high incidence of two species of invasive grasses: *Brachiaria (Urochloa decumbens)* and molasses grass (*Melinis minutiflora*).

We believe that the absence of an adequate germinating protocol has led to inconclusive results on that research. Therefore the outcome could not provide effective and practical suggestions to the Park Managers. That observation has led us to carry out the current study which aimed to check whether *Brachiaria* seeds (*Urochloa decumbens*) and molasses grass (*Melinis minutiflora*) have the capacity to germinate, grow and bear fruit in uncontrolled conditions after having been ingested and defecated by horses.

## Methods

For the experiment we acquired seeds of *Urochloa decumbens* and *Melinis minutiflora*, seeds obtained from commercial dealers. Three horses were used in experiment. 24 hours before feeding the horses feces already on the floor in their horse houses were collected and discarded.

In the morning, horse number 1 was fed with approximately 2 liters of ration only (T<sub>1</sub>). Horse number 2 was given approximately 2 liters of ration and 300 grams of *Urochloa decumbens* (T<sub>2</sub>). Horse number 3 was also offered the same amount ration with 300g of *Melinis minutiflora* (T<sub>3</sub>).

After the animals were fed, they were separated during the whole day and night. In the morning, the feces were collected separately in plastic bags and taken to laboratory for a screening. During the collecting we avoided to catch those feces which had contact with the ground. In the following two weeks the experiment was repeated until all the horses receive all treatments.

For each repetition of the experiment were separated 10 samples containing 500 ml, totaling 100 samples. Each sample was placed in aluminum trays of 20 x 12 x 3.5 cm containing 100 ml of vermiculite as substrate and placed in a green house. The experiment was designed in randomized blocks.

## Results

After a period of two months 529 plants germinated plants where 113 were *Melinis minutiflora*, 174 *Urochloa decumbens* and 246 plants of other species (table 1). In the T<sub>3</sub> treatment there was a higher germination rate of *Melinis minutiflora* and treatment T<sub>2</sub> the highest germination rate was *Urochloa decumbens*. In the treatment T<sub>1</sub> the highest germination rate was other species. Tukey tests confirmed these statistical differences.

Table 1. Amount of plants that germinated

	T1	T2	T3	Total
<i>Urochloa decumbens</i>	2	172	0	174
<i>Melinis minutiflora</i>	0	0	113	113
other species	137	52	53	242

As expected there was more grass germination rate of *Melinis minutiflora* in the T<sub>3</sub> treatment and *Urochloa decumbens* in T<sub>2</sub> treatment, since it was offered a great amount seeds of these species to. As the seed density was higher than the species, the germination rate was higher.

In spite of the horse decrease the rate of germination of these seeds, based on these data we can observe that if they are present in the stool, viable seeds of *Urochloa decumbens* and *Melinis minutiflora* have the capacity to germinate, grow, flowering and fruiting. In order that these species are introduced and forms a viable population is necessary to have an enabling environment, but once in place they can change the original characteristics of the vegetation.

Another relevant factor is the competitiveness of these species. The *Urochloa decumbens* is extremely aggressive, and *Melinis minutiflora* in open environments can become a threat to local species (Pivello; Shida; Meirelles, 1999).

According to a study by Ansong and Pickering (2013), a wide variety of species can germinate from stool horses, native or invasive. It can be observed in the study of Wells and Lauenroth (2007) that most of the seeds that germinated are small seeds, mostly herbaceous grasses because large seeds are more susceptible to damage by chewing (SIMÃO NETO, JONES; RATCLIFFE, 1987). All species that germinated in this study were grass or herbaceous. Although some studies indicate that some species germinated from the feces of animals, some failed to reach maturity. The species of this study demonstrated that characteristic indicating that it is possible that the feces of riding animals can introduce these species.

More research has to be done *in situ*, including different conditions of soil and vegetation. The results obtained may be used as subsidies for taking decisions about the use of riding animals in protected areas, since we will know for sure if the seeds contained in the horse feces really possess the capacity to establish on-site forming a capable population colonizing new areas and not just a causal species.



- ANDRADE, F.S.A. (2009). Contaminação biológica e o uso de animais de montaria no Parque Nacional da Serra do Cipó–MG. 2009. Tese (Doutorado em Recursos Florestais) – Escola Superior de Agricultura “Luiz de Queiroz”, Universidade de São Paulo, Piracicaba. 130 p.
- ANSONG, M. and PICKERING, C.M. (2013) A global review of weeds that can germinate from horse dung. *Ecological Management & Restoration*, p. 216-223.
- JANZEN, D.H. (1984). Dispersal of small seeds by big herbivores: foliage is the fruit. *American Naturalist*, Chicago, v. 123, n. 3, p. 338-353.
- NEWSOME, D.; COLE, D.N.; MARION, J.L. Environmental impacts associated with recreational horse-riding. In: BUCKLEY, R. (Ed) *Environmental Impacts of Ecotourism*, Cambridge: CABI Publishing. Chap. 5, p. 61–82 2004.
- PICKERING, C.M.; HILL, W. Impacts of recreation and tourism on plant biodiversity and vegetation in protected areas in Australia. *Journal of Environmental Management*, Gold Coast, v. 85, n. 4, p. 791-800, 2007.
- PIVELLO, V.R., SHIDA, C. and MEIRELLES, S.T. (1999) Alien grasses in Brazilian savannas: a threat to the biodiversity. *Biodiversity & Conservation*, p. 1281-1294,
- SIMÃO NETO, M, JONES, R.M. and RATCLIFFE, D. (1987) Recovery of pasture seed ingested by ruminants. 1. Seed of six tropical pasture species fed to cattle, sheep and goats. *Animal Production Science*, p. 239-246,
- VELLEND, M.; MYERS, J. A.; GARDESCU, S.; MARKS (2003). Dispersal of Trillium seeds by deer: implications for long-distance migration of forest herbs. *Ecology*, Göttingen, v. 84, n. 4, p. 1067-1072.
- WELLS, F.H. and LAUENROTH, W.K (2007). The potential for horses to disperse alien plants along recreational trails. *Rangeland Ecology & Management*, p. 574-577.