

SEED TRANSMISSION THROUGH THE DIGESTIVE TRACT OF THE HORSE

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Summary. A project was carried out at Roseworthy Agricultural College in 1989 to research the fate of seeds that pass through the digestive tract of the horse. The majority of seeds tested showed little or no loss in viability after transmission. Small seeds had higher levels of survival than large seeds. Seeds which had a high % hard seed before transmission had a high % of seed transmission survival. The rate of seed transmission was high on the 2nd and 3rd days after ingestion. Peak recovery of seed transmitted through the digestive tract of the horse occurred on the 4th day after ingestion. Of the seeds studied peaks ranged from 3 to 5 days. After peak recovery seed transmission declined till nil seed was recovered 13 days after ingestion. The work indicates that horses will disperse weed seeds for 10 days after ingestion and pass relatively high levels 4 days after ingestion. It was found that in a single day a horse has the potential to pass 700 live marshmallow seeds.

INTRODUCTION

The work was supported by the S.A. Horse Council and the S.A. Recreation Institute to research the fate of seeds transmitted through the digestive tract of the horse and to write a report to enable accurate planning for the safe development of horse riding trails in South Australia. (4)

Although it is possible to manage land application rate of animal manure to achieve pollution free operation, it is almost impossible to eliminate the associated agronomic problem of weed seed transmission. Weed seeds apparently pass uninjured through the digestive tract of farm animals and are consequently returned to the land with the manure (1). Suckling (5) recognised the survival of ingested seed as a means of spreading legumes on non-arable land. Seeds of many plants are passed in animal faeces (3). De Koning and Carter (2) found that subterranean clover seed had a survival rate of 4% when transmitted through the digestive tract of the sheep. Heap (1989 pers. comm.) found that in sheep, seed output peaked at day 3 with 7.2% of the seed being recovered. Reference is made to the sheep, a ruminant, for comparative purposes.

METHODS

The project consisted of two experiments, one using a mixture of pasture seed and the other a mixture of weed seeds. Six horses, individually penned were used in each experiment. Experiment 1 was carried out in December 1988. Seeds used in Experiment 1 were, Balansa clover (*Trifolium balansae* cv Paradana) Burr medic (*Medicago polymorpha* cv Serena) and Subterranean clover (*Trifolium brachycalycinum* cv Clare). Experiment 2 was carried out in April 1989. Seeds used in Experiment 2 were Marshmallow (*Malva paraviflora*), Onion weed (*Asphodelus fistulosus*) and Horehound (*Marrubium vulgare*). Weed seeds were collected from the field and cleaned in January 1989. In both experiments weighed amounts of seed mixes were fed with Equus Silver Horse Ration once at the commencement of an experiment. Faeces were subsequently collected and weighed at 9.00am and 5.00pm over a two week period. Sub samples of 100g were taken at each collection. Sub samples were washed through a 0.25mm sieve and dried at 40°C for 48 hours in a forced draught dehydrator. Dried samples were aspirated in an air column to separate seed. Recovered seed was identified, counted and calculations made as to the total number of seeds passed per day. Seed transmission was determined as a percentage of seed fed. Standard germination tests were performed on original and recovered seed. Data were submitted to analysis of variance.

RESULTS AND DISCUSSION

Table 1. Viability of seed before and after transmission through the digestive tract of the horse and mean total seed transmission as a % of ingested seed, over 13 days after ingestion.

Seed	Before transmission. (% live)	After transmission. (% live)	Seed transmission. (% over 13 days)
Balansa clover	59	90	21.0
Burr medic	96	87	11.0
Sub. clover	47	47	8.0
Marshmallow	60	53	17.0
Onion weed	100	0	0.9
Horehound	67	13	1.4

Table 1 indicates that the majority of seeds tested showed little or no loss in viability after transmission. The atypical results of onion weed are due to no hard seed found in the onion weed sample used and a rapid rate of germination leading to digestion. The variation in the viability of seeds transmitted through the digestive tract of the horse of different plant species suggests a need to test a wide range of seeds to ascertain the potential of the seed to be dispersed by horses. Additional tests found that there was a higher % seed survival with small seeds than large seeds and a higher % survival of seeds which had a high % hard seed before transmission.

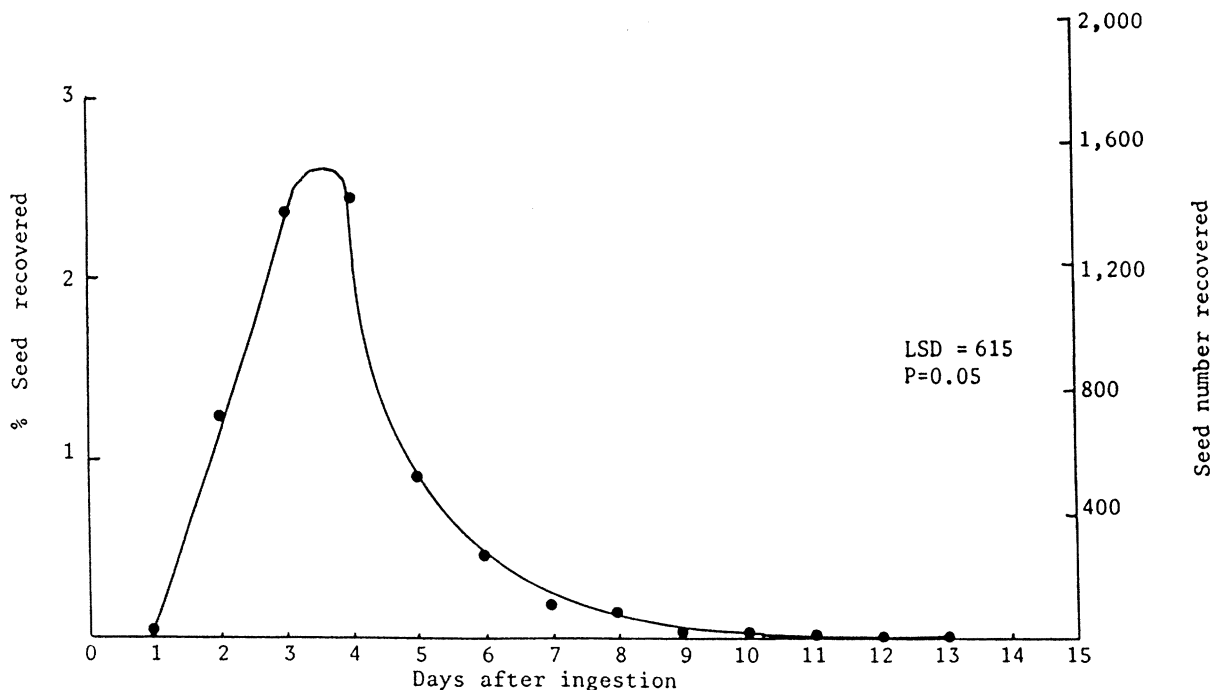


Figure 1. Sub clover seed transmission through the digestive tract of the horse, measured as mean % of ingested seed recovered per day.

Figure 1 is a typical graph of seed transmission through the digestive tract of the horse showing the peak at the fourth day and a decline thereafter. Subterranean clover had a total transmission level of 8% after 13 days, which was twice that found after transmission through sheep (2). The work indicates that horses will disperse weed seeds for 10 days after ingestion and pass relatively high levels 4 days after ingestion. It was found that in a single day a horse has the potential to pass 700 live marshmallow seeds.

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REFERENCES

1. Atkeson, F.W., Hulbert, H.W. and Warren, T.R. (1934) - Effect of bovine digestion and manure storage on the viability of weed seeds. *J. Amer. Agron.* 26 : 390-397.
2. De Koning, C.T., and Carter E.D. (1988) - The survival of seeds of subterranean clover following ingestion by sheep. Waite Agricultural Research Institute.
3. Dore, W.G. and Raymond, L.C. (1942) - Pasture studies XXIV. Viable seeds in pasture soil and manure. *Sci. Agric.* 23, 69-79.
4. St. John-Sweeting, R.S. and Morris K.A. (1990). Report to the S.A. Horse Council and S.A. Recreational Institute.
5. Suckling, F.E.T. (1950) - The passage of white clover seeds through the body of sheep and the effect on germination capacity. *Proc. N.Z. Grassland, Association.* 12 : 108-121.