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EVALUATING PERFORMANCE OF SEVERAL HORSE BEDDINGS

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The choice of bedding material is an important aspect of horse-barn management. Bedding can increase dust levels that can pose respiratory problems in both horses and their handlers. In addition, bedding choice will have an impact on the cost of housing horses, the labour involved with stall cleaning, manure storage capacity and, ultimately, nutrient management. The compostability of various materials will affect storage times. Aesthetically, bedding type is important because material that clings to a horse's coat can make a horse appear dirty. This Factsheet summarizes the data from a 2006 summer-student project as well as published papers on the topic. The pros and cons of four different types of horse beddings — wheat straw, pine shavings, peat moss and coir (a product made from coconut hulls) — are presented. The choice of material is dependent on several factors. The choice is the horse owners', based on personal preference and both internal and external factors.

THE BEDDING MATERIAL MARKET

The 1996 *Ontario Horse Industry Report* estimated that Ontario horse owners spent more than \$36 million on bedding annually. Table 1 depicts owners' preference in bedding use⁽¹⁾. The non-racing sector preferred using shavings over straw. In the racehorse sector, the external factor — the high disposal cost of non-straw bedding — dictates the use of straw. Straw bedding is recycled into the mushroom-growing industry.

TABLE 1. Expenditure and Percentage Usage of Bedding by the Ontario Horse Industry 1996

Bedding Type	Value and percent usage		
	Non-Racing Sector	Racing Sector	Total
Shavings	\$26.0 M (80.5%)	\$2.12 M (57.3%)	\$28.12 M (78.2%)
Straw	\$5.75 M (17.8%)	\$1.17 M (31.6%)	\$6.92 M (19.2%)
Peat moss	\$0.29 M (0.9%)	\$0.24 M (6.5%)	\$0.5 M (1.4%)
Other	\$0.26 M (0.8%)	\$0.17 M (4.6%)	\$0.43 M (1.2%)
Totals	\$32.3 M (89.8%)	\$3.7 M (10.2%)	\$36.0 M (100%)

FACTORS AFFECTING BEDDING USE

Absorbency

A good bedding material must absorb urine and excess water from the feces to keep the horses dry and comfortable. Four bedding substrates were tested to determine how much water they could hold (Trial 1). Three kilograms of each material were placed into nylon bags, submerged into a container of water for 24 hours, hung up to drain the excess liquid for 30 min and then reweighed. The procedure was repeated three times for each bedding substrate. The results are reported in Table 2. Column 1 identifies the bedding material (substrate). Column 2 indicates the number of litres of water that 1 kg of the substrate can hold. Column 3 shows how much water each substrate can hold as a percentage of its original weight (3 kg).

To put this data into perspective, a small bale of straw (14.4 kg) can absorb roughly 36 L of water. Since the average 454-kg (1,000-lb) horse produces 8–10 L of urine per day, a bale of straw can be expected to absorb 3–4 days of urine. However, many horses will consume a portion of their straw and, therefore, extra straw may need to be added to the stall.

Coir was by far the most absorbent material, absorbing 3.3 L per kilogram of material or 327% of its weight. The 9.6-kg bag can be expected to absorb 32 L of urine. This is similar to the bale of straw with absorption of about 3–4 days of urine. Peat moss, surprisingly, was the least absorbent.

TABLE 2. Water-Holding Capacities of Bedding Types on a Weight and Volume Basis

Bedding Material	Water-Holding Capacity (L/kg)	Water-Holding Capacity (%)
Wheat straw	2.6	257
Pine shavings	1.9	186
Peat moss	1.6	164
Coir	3.3	327

TABLE 3. Water-Holding Capacities of Trial #1 Compared With Re-Wetted Trial #2

Bedding Material	Water-Holding Capacity	
	Trial #1 (%)	Trial #2 (%)
Wheat straw	257	243
Pine shavings	186	132
Peat moss	164	249
Coir	327	259

Because the peat moss was not as absorbent as expected, the trial was repeated. For this trial, the same 3 kg of each material that had previously been submerged for 24 hr was air dried, weighed, and then submerged for a further 24 hr. This was done to test claims that some bedding materials actually absorb more water if they have been pre-wetted. The results of this second trial are outlined in Table 3.

Peat moss is the only substrate to demonstrate an increase in its water-holding capacity upon being re-wetted. All the other materials retained less water than they originally held. This is an interesting finding and now places pine shavings in last place for absorbency. Based on this data, when bedding a horse stall with peat moss, it might be beneficial to sprinkle the freshly bedded stall with some water to “kick-start” the ability of the peat moss to absorb water.

LABOUR AND STORAGE

The absorbency of the bedding material impacts on the labour associated with stall cleaning. If a horse is particularly “messy” in the stall, and the bedding material has a lower water-holding capacity, the stall will need to be stripped and the bedding material fully replaced each day.

The ease of separation of feces from the bedding substrate influences the ease of stall cleaning. Figure 1 gives a relative breakdown of how these four bedding types compare. It should be noted that there have been

no studies to reference how coir fits into this scheme. Like peat moss, a percentage of the fecal output quickly becomes ground into the coir and cannot be separated from the bedding. From the perspective of ease of cleaning of stalls, coir and peat moss are at the easy end of the spectrum, since the feces not picked up disappears into the bedding.

Directly related to the “ease-of-stall-cleaning” is the rate of bedding replacement. This is simply the amount of bedding that must be added each day after cleaning. A study looked at this specifically for peat moss, wheat straw and pine shavings. It was found that peat moss required the lowest additional amounts and, over the course of a year, the combination of manure and bedding produced by one horse amounted to only 9.8 cubic metres⁽²⁾. Shavings were next, with 12.4 cubic metres of manure/horse/year⁽²⁾. Wheat straw came in last in this category at 19.5 cubic metres manure/horse/year⁽²⁾. The reason behind straw’s high replacement rates is a combination of difficulty in separating the manure from the bedding and the frequency that horses will eat a percentage of the straw bedding⁽²⁾. Again, coir was not examined in this study, but it would be reasonable to assume that its replacement rate would be similar to that of peat moss.

Storage capacity and rate of composting is an important consideration with nutrient management. In a study looking at the compostability (how fast a material breaks down) of peat moss, wheat straw and pine shavings, only peat moss was ready to be spread after one month in the composter. Wheat straw and pine shavings remained relatively unchanged⁽²⁾. The horse manure itself is broken down quickly, but the bedding substrate often remains. Coir presents a composting challenge. It is very high in lignin, which makes it very difficult to break down⁽³⁾. In fact, to make coir decompose at all requires the addition of a fungus, urea and water⁽³⁾. Despite this somewhat labour-intensive drawback, the coir compost should be ready to use after a month⁽³⁾.

Peat moss seems to be the best choice of bedding from a labour standpoint and from a composting point of view. The other substrates have some complications.

WHAT ABOUT THE HORSE’S POINT OF VIEW?

Labour considerations and a happy barn staff are essential when considering choice of bedding, but let us not forget the horse. It is, after all, the horses that will be using the bedding, not humans. Horses preferred straw and shavings equally, not preferring one over the other⁽⁴⁾. This study did not look at peat moss or coir but it did find that horses prefer bedding over a hard surface, meaning that any bedding substrate is better than none⁽⁴⁾.

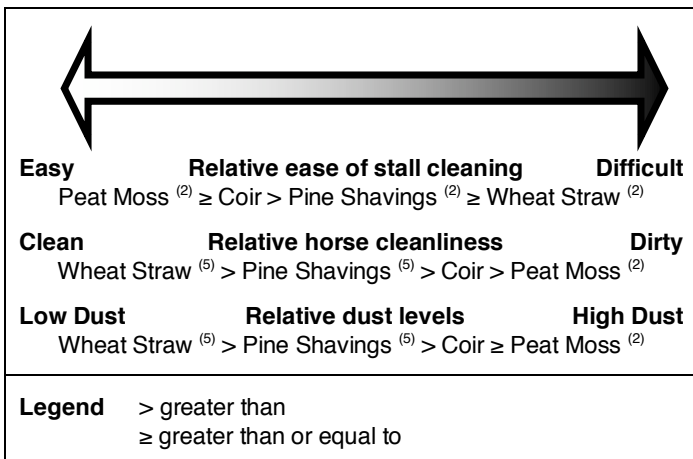


FIGURE 1. Relative Comparisons of the Four Bedding Types

From the point of view of horse cleanliness, the bedding materials do differ. Figure 1 outlines the relative bedding transfer to hair coat for all four materials. Horse cleanliness may or may not be an important issue depending on the facility and the activities of the horses. If keeping horses clean is a priority at a facility, peat moss would not be the substrate of choice, especially if the horses will be entering their stall wet (e.g., from bathing or being out in the rain). Peat moss will stick to wet horses.

Finally, the dustiness of the bedding will impact on the horse. Dusty bedding can contribute to “heaves,” a respiratory condition in horses, and it can also negatively affect the health of barn staff⁽⁶⁾. Dust in hay and straw can be caused by dirt being splashed onto the straw and hay windrows while still in the field; the growth of moulds, either in the windrow or in the mow; and by the presence of fines (chaff and leaf shatter) in the substrate. With shavings, the degree of dustiness depends on the particle size, e.g., sawdust versus planing. Peat moss and coir are dusty because of their fine particle size.

DOLLARS AND SENSE

Not only is it important to think about the absorbency, labour and horse issues, but the cost of the bedding plays a major role in deciding how suitable it is for your facility. The cheapest bedding material may not be the best solution, and management is a major consideration. Table 4 outlines the cost of each substrate on a per kilogram basis as well as on a per-litre-of-water-absorbed basis.

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TABLE 4. Cost of Material

Material	Cost of material	Cost per litre of absorbency
Wheat straw	14 ¢/kg	5.4 ¢/L
Pine shavings	29 ¢/kg	15 ¢/L
Coir	125 ¢/kg	38 ¢/L
Peat moss	21 ¢/kg	13 ¢/L

The costs of the four bedding substrates are based on the following: \$2 for a small 14-kg bale of straw; \$5.25 for an 18.3-kg bag of pine shavings; \$7 for a 33.6-kg bag of peat moss; \$12 for a 9.6-kg bag of uncompressed coir bedding. The costs in your area may vary considerably. The cost in cents-per-litre-of-water-absorbed were calculated by dividing the price per kilogram by the litres of water absorbed per kilogram. Although coir is the most expensive bedding on this list, it is important to figure in the rate of replacement when considering these numbers. Straw is cheap but requires larger additions to the stall daily; whereas coir will last longer in a stall, so the total requirement is less.

Obviously, there is a lot to take into account when selecting a bedding material for your horses. Consider each aspect and how it will impact on the management of your facility. Select the bedding that fits best with your needs. On some farms, the “child-labour” aspect must be considered. Some children won’t clean the stalls if straw is used. In contrast, it is easier to place a few bales of straw in the run-in shed during the winter than it is to deal with hauling loose shavings through snowdrifts in a wheelbarrow.

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