

# INFOSheet

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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, on 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 information sheet summarizes the data from a 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 dependant on several factors. The choice is the horse owners', based on their 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 owner's preference in bedding use<sup>(1)</sup>. 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 | Non-Racing Sector<br>value and percent usage | Racing Sector<br>value and percent usage | Total Value and<br>Percent Usage |
|--------------|--|--|----------------------------------|
| 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. M (100%)                  |

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## Factors Affecting Bedding Use:

### 1. 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 was placed into nylon bags, submerged into a container of water for 24 hours, hung up to drain the excess liquid for 30 minutes 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 one kilogram of the substrate can hold. Column 3 shows how much water each substrate can hold as a percentage of its original weight (3 kg).

**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                        |

To put this data into perspective, a small bale of straw (14.4 kg) can absorb roughly 36 litres of water. Since the average 1,000-lb horse produces 8-10 litres of urine per day, a bale of straw can be expected to absorb 3 to 4 days of urine. However, many horses will consume a proportion 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 to 4 days of urine. Peat moss surprisingly was the least absorbent.

Because the peat moss was not as absorbent as expected, the trial was repeated. For this trial, the same three kilograms of each material that had previously been submerged for 24 hours was air dried, weighed, and then submerged for a further 24 hours. 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**.

**Table 3. Water Holding Capacities of Trial #1 Compared with Re-wetted Trial #2**

Absorbency is expressed as litres of water absorbed per kilogram of bedding and expressed as a percentage.

| Bedding Material | Water Holding Capacity Trial 1 (%) | Water Holding Capacity Trial 2 (%) |
|------------------|------------------------------------|------------------------------------|
| Wheat Straw      | 257                                | 243                                |
| Pine Shavings    | 186                                | 132                                |
| Peat Moss        | 164                                | 249                                |
| Coir             | 327                                | 259                                |

Peat moss is the only substrate to demonstrate an increase in its water-holding capacity upon being re-wetted. All of 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.

## 2. 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.

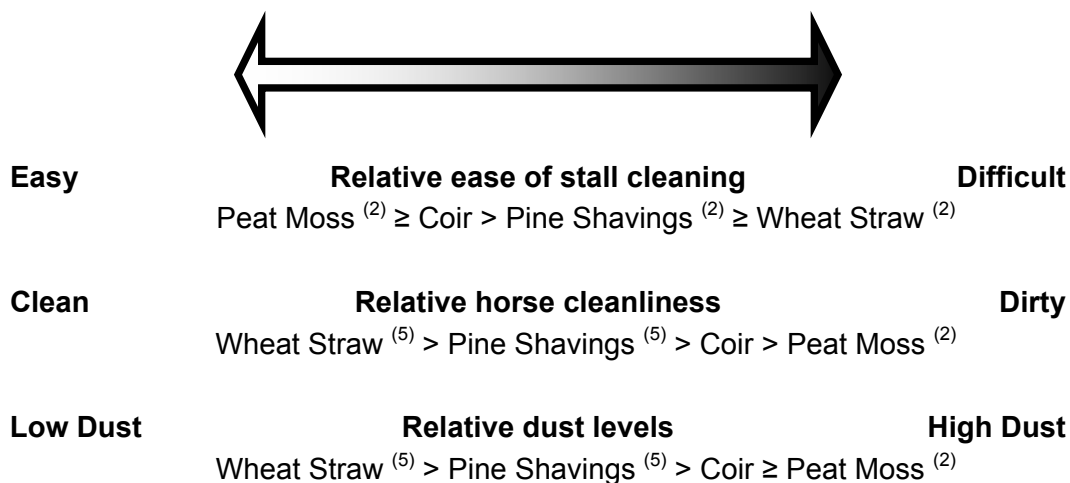
**Figure 1** gives a relative breakdown of how these four bedding types compare. It should be noted that there have been no studies to reference how coir fits into this scheme. Like peat moss, a percentage of the fecal output quickly becomes ground into the coir and can not be separated from the bedding. From an “ease-of-cleaning-of-stalls” perspective, 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 meters <sup>(2)</sup>. Shavings were next, with 12.4 cubic meters of manure/horse/year <sup>(2)</sup>. Wheat straw came in last in this category at 19.5 m<sup>3</sup> manure/horse/year <sup>(2)</sup>. 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 <sup>(2)</sup>. 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 compost-ability (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 <sup>(2)</sup>. 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 <sup>(3)</sup>. In fact, to make coir decompose at all requires the addition of a fungus, urea, and water <sup>(3)</sup>. Despite this somewhat labour-intensive drawback, the coir compost should be ready to use after a month <sup>(3)</sup>.

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.

**Figure 1. Relative Comparisons of the Four Bedding Types**



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### 3. From 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. From a preference point of view, horses chose straw and shavings equally, not preferring one over the other<sup>(4)</sup>. This study did not look at peat moss or coir but it did find that horses do prefer bedding over a hard surface, meaning that any bedding substrate is better than none<sup>(4)</sup>.

From a horse cleanliness point of view, 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<sup>(6)</sup>. 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 molds, 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.

### 4. 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 3** outlines the cost of each substrate on a per kilogram basis as well as on a per-litre-of-water-absorbed basis.

**Table 3. Cost of Material**

| Material      | Cost of material (¢/kg) | Cost per litre of absorbency (¢/L) |
|---------------|-------------------------|------------------------------------|
| 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 on a daily basis; whereas coir will last longer in a stall so the 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. Around our house, we have to factor in the "child-labour" aspect. The kids won't clean the stalls if I use straw. 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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