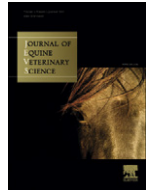




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Original Research

## Acceptability of Teff Hay by Horses

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### ABSTRACT

Teff (*Eragrostis tef*) is a productive warm season annual grass. Because teff is relatively new to the horse industry in the United States, horses unaccustomed to teff hay were used in two sets of two-choice preference tests comparing teff with alfalfa hay or teff with timothy hay. A second experiment used mature mares to compare voluntary dry matter intake (VDMI) of teff hay and timothy hay. In the two-choice preference tests, horses preferred alfalfa hay and timothy hay to teff hay ( $P < .05$ ). Horses preferred teff hay that was cut at an earlier stage of maturity and had lower concentrations of neutral detergent fiber and acid detergent fiber than teff hay cut at a later stage of maturity. In the VDMI experiment, four mares were fed teff hay and four mares were fed timothy hay for 17 days. Both hays had been harvested in the head stage of maturity. VDMI was measured during the last 10 days and was not different between the two groups of horses ( $P > .05$ ). It was concluded that horses that are unfamiliar with teff may discriminate against it when it is offered simultaneously with alfalfa or timothy; however, if not given a choice, horses will consume approximately the same amount of mature teff as mature timothy. Additional studies are needed to compare VDMI of early maturity teff hay with other common hays.

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## 1. Introduction

Teff (*Eragrostis tef*) is a warm season annual grass that originated in Africa where it is used primarily for grain production. Recently, nongrain varieties of teff that can be grazed or harvested for hay have become available in the United States [1]. Under good growing conditions, several cuttings of teff can be harvested from one planting, and annual dry matter yields in excess of 4 tons/acre have been reported [2,3]. Because teff can produce relatively large yields in a short growing season, it can be an appealing crop for hay producers. When harvested in early maturity, teff hay has been reported to have a nutrient composition similar to timothy hay [1] or full bloom alfalfa hay [4]. However, no feeding experiments have been reported that compare teff with other common horse hays.

If horses discriminate against a novel feed when it is first offered, horse owners may be reluctant to continue using it in their feeding programs. Horses appear to prefer legumes and some cool season grasses to most warm season grasses [5-7]. Because teff is a warm season grass, it may have lower palatability than legume or cool season grass hays. Similarly, lower voluntary dry matter intakes (VDMI) have been reported for warm season grasses than for legumes and some cool season grasses [5,8,9]. If intake is reduced when teff is fed to horses, then daily nutrient intakes may be reduced as well. Depending on nutrient composition and nutrient availability, limited VDMI of teff could result in marginal or deficient nutrient intakes by horses [10].

Because studies comparing teff with common horse hays have not been reported, we conducted two experiments. In experiment 1, we used two sets of two-choice preference tests to determine whether horses accepted tests as readily as timothy hay or alfalfa hay. Preference tests were conducted without adapting horses to teff hay to simulate a situation in which a horse owner would offer the

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**Table 1**  
Chemical Composition (DM Basis)<sup>a</sup> of the Hays Used in Experiment 1

	E-Teff <sup>b</sup>	L-Teff <sup>c</sup>	Alfalfa	Timothy
Dry matter (%)	89.7	90.3	87.5	93.7
Neutral detergent fiber (%)	66.0	71.7	49.2	61.7
Acid detergent fiber (%)	38.0	44.6	39.5	42.9
Crude protein (%)	8.9	10.1	17.9	7.6
Calcium (%)	0.5	0.45	0.8	0.44
Phosphorus (%)	0.27	0.26	0.38	0.11

<sup>a</sup>Analyses performed by Dairy One (Ithaca, NY).

<sup>b</sup>Teff hay cut in the early heading stage.

<sup>c</sup>Teff hay cut in the late heading stage.

hay for the first time. In experiment 2, we compared VDMI of mature horses offered either timothy hay or teff hay for a longer period.

## 2. Materials and Methods

### 2.1. Experiment 1: Palatability Comparison for Teff, Alfalfa, and Timothy Hays

Two sets of two-choice preference tests were conducted to compare the palatability of teff hay with timothy hay and alfalfa hay. Two lots of teff hay, one lot of timothy hay, and one lot of alfalfa hay were used. The two teff hays used in this experiment included a small lot that had been harvested in the early heading stage (E-Teff; *E tef*, var. "Tiffany") approximately 1 year before the study and a larger lot that had been harvested at the late heading stage (L-Teff; *E tef*, var. "Horse Candy") approximately 1 month before the study. Teff hay cut in a boot or vegetative stage of maturity was not available, so the alfalfa and timothy hays that were used in these preference tests were selected to be of comparable maturity. The alfalfa hay had been harvested at full bloom, and the timothy was in the late heading stage of maturity. Before beginning the preference tests, all hay was core-sampled and analyzed for chemical composition (Table 1).

In the first set of preference tests, four mature mares (5-15 years) were used. In the second set of preference tests, four different mature mares (5-9 years) were used. Horses were placed individually in 3 × 12 m<sup>2</sup> partially covered pens with automatic waterers. All mares had been acclimated to the individual housing and to consuming hay from hay nets for 3 weeks before the preference tests. On the 2 days before each set of preference tests, and on each day after the preference tests were concluded, mares had ad libitum access to the full bloom alfalfa hay. Hay was offered in two hay nets suspended over a large bin. Preliminary analysis of the test hays indicated that they were low in several minerals, including copper, zinc, and selenium; therefore, in addition to hay, mares received 0.45 kg of a protein-mineral supplement to ensure that mineral needs were met. The preference tests were conducted on 3 consecutive days. On each day that a preference test was conducted, mares were fed their supplement at 8 AM and then turned out into dry lots for 2 hours. Each pen was cleaned, and all hay remaining from the previous day was removed. On day 1 of the first set of two-choice preference tests, the mares were randomly assigned to receive one of the following hay combinations: alfalfa and

E-Teff; alfalfa and L-Teff; or E-Teff and L-Teff. Mares were then offered a different combination of the hays on days 2 and 3 so that each mare received all possible combinations during the 3-day period. The second set of preference tests was conducted using four different mature mares, but other procedures were similar. In the second set of preference tests, mares were offered the following hay combinations: timothy and E-Teff; timothy and L-Teff; and E-Teff and L-Teff.

Each preference test was conducted using two hay nets. Hay was placed in the first net, the filled net was weighed, and then it was hung above the collection bin. The first hay net was randomly assigned to either the left or right position. The second hay net with the other test hay was then weighed and hung in the other position. The hay nets were hung close to each other so that the horse could have access to both nets without moving. After both hay nets were suspended in each mare's pen, the mares were brought in from the dry lots and given access to both hay nets for 1 hour. After 1 hour, the hay nets were removed, reweighed, and hay disappearance from each net was calculated. At the beginning of each 1-hour period, each net contained approximately 4 kg of hay. This amount was used so that horses would have both test hays available for the full 1-hour period, and at the end of each 1-hour period, all nets had some hay remaining. Some hay particles fell from the nets into the bin below, but the amount was small (0.2 ± 0.04 kg), and the difference in texture between the hays made it relatively easy to differentiate the teff from either alfalfa or timothy. The mares were given no hay for 1 hour and then hay was offered again, except that the right and left positions of the hay nets were reversed. At the conclusion of the second measurement period on each day, the horses were offered their normal allotment of alfalfa hay. Hay disappearance during the two, 1-hour eating periods was then averaged for each horse. Within each set of preference tests (alfalfa vs. teff or timothy vs. teff), data were initially analyzed using analysis of variance for main effects due to horse, day, or hay. There were no effects due to day or horse, but in both sets of tests, the effects due to hay were significant ( $P < .05$ ). Comparisons between each hay pair (alfalfa vs. E-teff, alfalfa vs. L-teff, etc.) were then made using a Student *t* test. Significance was accepted at  $P < .05$ .

### 2.2. Experiment 2: Comparative Intake of Teff Hay and Timothy Hay

Eight mature mares (5-15 years; initial body weight [BW]: 468-593 kg) were housed in individual 3 × 12 m<sup>2</sup> partially sheltered pens with automatic waterers. The sheltered area of the pen had rubber-mat flooring, and the remainder of the pen had a packed limestone floor. Mares remained in the pens for the duration of the study except for 6 hours each day when they were turned out into dry lots for free exercise. At the beginning of the study, mares were randomly assigned to receive either teff hay or timothy hay. The teff hay and timothy hay were obtained from the same suppliers as in experiment 1. Teff hay cut at an early stage of maturity was not available, and both hays were in the head stage. All hay to be used was sampled before the study and analyzed for dry matter, neutral detergent fiber (NDF), acid detergent fiber (ADF), crude

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