

## Proso Millet Varieties for Western Nebraska

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This NebGuide describes proso millet varieties that are suitable for dryland, organic (nonirrigated), and irrigated production in western Nebraska.

Proso millet (*Panicum miliaceum* L.) was introduced to the United States by German-Russian immigrants in 1875. Proso millet is the best alternative crop for diversifying and intensifying winter wheat-based dryland production systems in western Nebraska. This is due to its ability to produce grain under limited water conditions on marginal soil with low agronomic inputs.

When used in a wheat-based rotation, proso millet improves wheat productivity by controlling winter annual grassy weeds, reducing insect and disease pressures, and preserving deep soil moisture for wheat (See UNL Extension Circular, *Producing and Marketing Proso Millet in the Great Plains*, EC137).

Almost all proso millet in the U.S. is conventionally produced under dryland/rainfed conditions in Colorado, Nebraska, and South Dakota (USDA-NASS 2012), primarily for the bird seed industry. Nebraska has been the second highest producer of proso millet in the U.S. In 2012 Nebraska's proso millet production contributed \$13 million to the economy of the Nebraska Panhandle.

In addition, there is a niche market for organic proso millet in the food and alcohol markets (See UNL NebGuide, *Alternative Uses of Proso Millet*, G2218). Proso millet is also grown under irrigation for specific reasons, such as when irrigated wheat fields are lost due to late hail or when the market price is very high as in 2012. There are approximately 10,000 acres each of irrigated and organic proso millet in the U.S. (USDA-NASS 2012). About half of these acres in both cases are in Nebraska.

All proso millet varieties were developed for high grain yield under dryland production conditions in western Nebraska. No proso varieties were specifically developed for irrigated or organic production. Are all these varieties also suitable under organic and irrigated conditions? High-yielding wheat varieties for conventional dryland production



are not necessarily good for organic production (See UNL NebGuide, *Selecting Winter Wheat Cultivars for Organic Production*, G2206). Wheat varieties for dryland and irrigated production are different (See UNL Extension Circular, *2013 Fall Seed Guide*, EC103). To determine if the same is true in the case of proso millet, common varieties were tested under dryland, organic, and irrigated production conditions in western Nebraska.

### Varieties

Proso millet varieties commonly grown in western Nebraska are Horizon, Sunrise, Huntsman, Earlybird, Sunup, Dawn, and 172-2-9, the new variety, which is expected to be released in 2013. All of these varieties were developed and released by the University of Nebraska–Lincoln Agricultural Research Division.

### Horizon

Horizon has large, white seeds and has a mid-early maturity. It has fair straw strength, short plant height, and good test weight.

## Sunrise

Sunrise is a moderately early maturing variety. Plant height is a little shorter than Sunup with comparable standability. Test weight is above average. Yield performance has been slightly superior to Sunup. Sunrise has a white seed coat and large seed size.

## Huntsman

Huntsman is a moderately late maturing variety. Yield performance, test weight, plant height, and straw strength are all similar to Sunup. It has a white seed coat and large seed size similar to Dawn.

## Earlybird

Earlybird has a moderately early maturity. It matures a few days later than Dawn and a few days earlier than Sunup. Plant height is shorter than Sunup with good straw strength. While test weight is slightly less, yield has been similar to Sunup. Earlybird has a white seed coat and large seed size.

## Sunup

Sunup is white seeded with seed being intermediate in size, between Dawn and Rise. It has a good yield record under fallow and no-till and when planted early or late.

## Dawn

Dawn has short plant height with a tight panicle. It is the earliest maturing variety among the commonly grown varieties in western Nebraska. It has a large, white seed and the grain is similar in appearance to Sunrise. It is adaptable anywhere millet is grown. It may be direct-harvested rather than swathed because of its short stature and early maturity.

## 172-2-9

This variety has a cream-colored seed and the panicle is compact. It matures significantly earlier than PI436626, the waxy parent material, and about five to seven days earlier than Huntsman. Plant height is significantly shorter than both Huntsman and PI436626, and is similar to Horizon and Dawn. This line is less prone to lodging than Huntsman. Seed size is smaller than Huntsman, but significantly larger than the waxy parent material. Expected to be released in 2013, this variety is the first that has waxy-type starch.

These varieties were tested under dryland, organic, and irrigated production conditions at Sidney and Scottsbluff, Neb. All these varieties yielded differently under three different production conditions (*Table I*). A few varieties, such as Horizon and Dawn, yielded consistently high and low, respectively, across the three conditions. However, some varieties yielded high under one condition but low under a different condition. For example, Sunrise is a high-yielding variety under dryland and organic conditions but low under

irrigation. The line 172-2-9 is a high-yielding variety under irrigation but yields poorly under dryland and organic conditions.

**Table I. Grain yields of proso millet varieties under dryland, organic, and irrigation.**

Variety	3-year average grain yield (lb/acre)			
	Released	Dryland	Organic	Irrigated
Horizon	2002	2603	2257	2932
Sunrise	1995	2678	2376	2323
Huntsman	1994	2475	2326	2323
Earlybird	1994	2237	2140	2567
Sunup	1989	2556	1970	2163
Dawn	1976	1983	1697	2269
172-2-9*		2508	2117	2738

\*Expected to be released in 2013.

## Suitable Varieties for Different Production Conditions

Varieties with grain yields above the trial average include:

- **Dryland/rainfed:** Sunrise, Horizon, Sunup, 172-2-9, and Huntsman. These varieties are not significantly different among themselves. However, yields of these five varieties are significantly different from Earlybird and Dawn. Dawn has the lowest yield and is significantly different from Earlybird.
- **Organic:** Sunrise, Huntsman, Horizon, Earlybird, and 172-2-9. These varieties are not significantly different among themselves. Yields of Sunrise, Huntsman, and Horizon are significantly different from both Sunup and Dawn. Earlybird and 172-2-9 are not significantly different from Sunup. Dawn has the lowest yield and is significantly different from Sunup.
- **Irrigated:** Horizon, 172-2-9, and Earlybird. These three varieties are significantly different from Sunrise, Huntsman, Dawn, and Sunup. Horizon and 172-2-9 are not different. Horizon is different from Earlybird but 172-2-9 is not different from Earlybird. Sunup has the lowest yield under irrigation.

## Grain Composition

Grain composition may not be very important when proso millet is used for bird seed. But it is important when proso millet is used for human food and alcoholic beverages. Starch, protein, crude fiber, and ash vary from 60-67 percent, 10-11 percent, 5-8 percent, and 3-4 percent, respectively (*Table II*). Fat content in all the varieties is 4 percent.

There is substantial difference in the starch and protein content among the commonly grown varieties, which is important information when used for human food. This seed composition data is for dryland-grown proso millet grain. Future research will determine seed composition using grains produced under organic and irrigated production.

**Table II. Commonly grown proso millet varieties and their important biochemical components. Seed from 2012 was used for the analysis.**

<i>Variety</i>	<i>Starch %</i>	<i>Protein %</i>	<i>Crude fiber %</i>	<i>Fat %</i>	<i>Ash %</i>
Horizon	64	11	5	4	4
Sunrise	63	10	7	4	4
Huntsman	61	11	7	4	4
Earlybird	67	11	7	4	3
Sunup	67	13	5	4	3
Dawn	67	12	6	4	3
172-2-9	60	11	8	4	4

## Summary

This NebGuide presents data showing that some proso millet varieties are better under dryland than irrigated conditions and vice versa. None of these varieties produce significantly higher yield under irrigation than dryland. This is expected since variety development was targeted for dryland production. The following chart shows proso millet varieties that have high yield potential under dryland, organic, and irrigated production.

### Production condition Proso millet varieties

Dryland:	Sunrise, Horizon, Sunup, 172-2-9, and Huntsman
Organic:	Sunrise, Huntsman, Horizon, Earlybird, and 172-2-9
Irrigated:	Horizon, 172-2-9, and Earlybird

This means that producers may select a specific variety for specific production conditions, which may result in higher grain yield than using a nonselective variety.

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