Alternative Crop Guide
Published by the Jefferson Institute

BUCKWHEAT

A Versatile Short-Season Crop

Overview

Buckwheat is an unusually fast-growing crop with a variety of uses. It's flexibility and wide adaptation led it to be grown on more than a million acres in the U.S. in the late 1800s, even though it is not native to our country. George Washington and Thomas Jefferson were two of the first American farmers to grow buckwheat and recognize the benefit to their crop rotation. With increased focus on specializing in the major commodities during the 1900s, buckwheat became much less common. However, in recent years it has started to regain acreage due to increasing export markets. In recent years, some farmers in north Missouri grew buckwheat under contract with a major buckwheat processor. Overall acreage in the U.S. has climbed to more than 70,000 acres, with millions of acres grown worldwide. Russia, where buckwheat is native, has the largest acreage of buckwheat.

U.S. buckwheat production has been concentrated in the northern Plains in the last couple of decades, where it is planted in early summer. The long growing season available to Missouri producers provides an opportunity to grow buckwheat as a double crop after wheat harvest. Buckwheat can be planted much later than soybeans, as late as August 1st in many parts of the state. The crop matures in a little over two months, allowing it to be used for double cropping farther north than other crops such as soybeans. Buckwheat can also be grown as a double crop after spring crops such as oats, flax or spring canola.

Most buckwheat is ground into flour and used for a variety of foods, including noodles in Japan and pancakes and breakfast cereals in the U.S. Russians and eastern Europeans make a wide range of foods with buckwheat. Buckwheat has also been used widely as a cover crop to smother weeds and improve the soil. The crop seems to improve soil tilth, and is reported to make phosphorous more available as a soil nutrient, possible through root-associated mycorrhizae. Buckwheat flowers profusely, making it popular with bee keepers and an attractive crop in the landscape.

Plant Description

Buckwheat *(Fagopyrum esculentum* Moench) is a broadleaf plant native to northern Asia. Seeds are brown in color, roughly the size of a soybean, but irregularly-shaped with four triangular surfaces. The seeds germinate and emerge rapidly when planted in warm soil, typically in three to four days. Plants grow rapidly, producing small heart-shaped leaves with slender, hollow stems. Although a field of buckwheat in full flower appears to cover the ground densely, each individual plant, if pulled up, will appear rather spindly upon close inspection.

Flowering begins about three weeks after planting and proceeds prolifically for a few weeks before gradually tapering off as the plant matures. At the peak of flowering, a buckwheat field is a striking sea of white petals. After a flower is pollinated, a full-sized seed will form within 10 days, although that seed will need another week or two to reach maturity. Seeds appear and mature earlier on the lower stem, with seed development continuing up the stem as the plant matures. The prolific flowers on buckwheat have made the crop a good nectar source for honey bee keepers.

Plant height and speed of maturity depend on the planting date. If planted early in the summer with good fertility, plants will usually be at least three feet (about 1 m) tall, and may take 11 to 12 weeks to mature. If planted in the latter part of July, buckwheat will mature in about 9 to 10 weeks and will be shorter, about 30 inches on good soils and 24 inches tall or less on poor soils. A hot, dry period during plant development will limit the vigor and size of the crop. Buckwheat is not

(continued on page 4)

How to Grow Buckwheat

Site Selection

Buckwheat grows best on soils that are neither too compacted, nor too coarse or sandy. It can tolerate wet soils to a slight degree, but will generally fair better on soils where drainage is adequate. A field that had wheat harvested under wet conditions will probably need to be tilled to avoid compaction problems with buckwheat. Buckwheat growing in compacted tire tracks will often be stunted in growth. Buckwheat does not require highly fertile soils, but benefits from having modest levels of nitrogen fertility.

Place in the Rotation

In northern areas where most buckwheat is grown, buckwheat is usually planted in early summer, following a small grain that was harvested the previous summer. In Missouri, buckwheat should be grown as a double crop after winter wheat or canola is harvested. It could also be double cropped after an early spring crop, such as spring canola, oats or flax, which are all harvested in July. Missouri-grown buckwheat benefits from later planting, and is economically viable only as a double crop in this region. In certain situations where rainfall has prevented planting a commodity or hail has destroyed one, buckwheat can serve as an emergency late season crop. In these situations, care must be taken to avoid fields where residual broadleaf herbicides have been applied in recent months; otherwise, the buckwheat seedlings may be killed by the residual herbicide during or shortly after emergence (buckwheat is sensitive to atrazine, trifluralin and sulfonylurea herbicides). A cash crop, such as corn or soybeans, may benefit by being grown after buckwheat due to its reported soil-improving properties.

Varieties and Seed Sources

There are very few buckwheat varieties available in the U.S, and they do not differ greatly from each other. The standard two varieties in the last couple of decades have been Mancan and Manor, both Canadian varieties. Mancan and Manor differ only in one small, insignificant trait having to do with flower color (both have predominately white flowers). Mancan and Manor are available from a few different seed sources. Many seed dealers carry “common” buckwheat. Usually common buckwheat is simply Mancan, Manor or a mixture of the two, that has lost its identity over the years. Some food buyers will not accept common buckwheat and will buy only the named varieties, so it is better to avoid generic buckwheat if it is being grown for the grain market.

The same Canadian breeder who developed Mancan and Manor as public varieties, has in recent years been developing proprietary varieties for Minn-Dak Growers, Ltd. Minn-Dak has recently started contracting for production of two new varieties, Koban and Koto, and they have a few characteristics different from the earlier varieties. Both the new varieties have a larger seed size, and higher test weight, than Mancan and Manor. Koto or Koban are only available to farmers growing buckwheat under contract to Minn-Dak, who also sells the older public varieties (701-746-7453). Another seed source for Mancan or Manor seed is Albert Lea Seed House (800-352-5247).

Planting

Buckwheat is not frost tolerant, so it cannot be planted in early spring in Missouri, even when used as a cover crop. For maximum grain yield, buckwheat should be planted in mid- to late July. In central Missouri, buckwheat can be planted in early August, and in southern Missouri, as late as the second week in August. The later buckwheat is planted, the faster it will mature. The reason to plant buckwheat relatively late is to push flowering into a period when nights are starting to cool down, which will normally be the case in late August or early September. The percentage of flowers that develop into seeds increases if flowering occurs during cooler periods. Night temperatures appear to be more important for yield than day temperatures. The downside of planting in late July is the risk of experiencing a dry August during buckwheat establishment.

Most farmers who have grown buckwheat in Missouri as a double crop after wheat, have planted it with no-till drills directly into wheat stubble. This has the advantage of preserving soil moisture and minimizing trips over the field. If no-till planting is to be used, it is best to wait at least a couple of weeks after wheat harvest before planting; this allows volunteer wheat and weeds to emerge, so that a burndown herbicide application can be used prior to planting. If compaction is a concern or herbicides are being avoided, then pre-plant tillage should be used with the goal of preparing a relatively fine seedbed.

Buckwheat should be planted about 1 inch deep. To get maximum yields, narrow rows should be used. Ideally, rows should be as close as 6 inches apart. A seeding rate of around 55 pounds per acre is generally adequate for the larger seeded Koban and Koto, while 50 pounds per acre can suffice for Mancan or Manor.

Fertility

When double cropping buckwheat after wheat or canola, some supplemental nitrogen fertilizer will normally be needed. Around 50 pounds per acre of nitrogen is generally quite adequate. Higher rates of nitrogen can actually have a negative effect, causing the buckwheat to get excessively tall and start falling over (lodging). If buckwheat is being grown organically, some source of nitrogen should still be provided or a clover can be overseeded into the wheat in the spring. After wheat harvest, the clover can grow a few weeks, then be tilled in immediately prior to buckwheat planting (this approach may deplete the seed zone moisture needed to establish the buckwheat).

If the soil is low in phosphorous (P) or potassium (K), a little additional P and/or K should be added to the fertilizer applied for wheat the previous fall to cover the extra fertility needed for the double crop. Buckwheat is tolerant of somewhat acidic soils, down to about 5.5 pH.

Pest Management

Weed control

Buckwheat is frequently used as a summer cover crop because of its rapid growth and ability to out-compete weeds. This fact demonstrates why buckwheat can be grown for grain without post-emergence herbicides. The main requirement is to control weeds that might come up ahead of buckwheat seedlings by using a burn-down herbicide, such as glyphosate (Roundup), or by tilling just prior to planting. If wheat seeds left in the field after harvest have not already volunteered as the time of buckwheat seeding approaches, it may be necessary to do a light tillage to induce their sprouting. A second tillage pass several days later (or a herbicide application) should be done before the buckwheat is planted. At the time this guide was written, there were no post-emergence herbicides labeled for buckwheat, although it is expected that Poast will become labeled in the next few years for post-emergence grass control.

Diseases and Insects

Buckwheat has been relatively pest free during several years of field production in Missouri. Occasionally grass hoppers will nibble on the leaves, but no extensive insect damage has been noted. Pollinators will be present during buckwheat flowering, including honey bees, and soldier beetles that may show up to feed on grasshopper eggs and other insects. Diseases have not been a problem with buckwheat, although extremely wet conditions could promote seedling or root rot disease on rare occasion.

Harvest and Storage

Buckwheat can either be direct combined or swathed and windrowed. Most Northern Plains buckwheat growers swath buckwheat, but it is usually direct combined in Missouri. For direct combining, a rough rule-of-thumb is to start combining when about 80 to 90% of the plant and seeds are brown. It is normal for buckwheat to still have a few green leaves, green seeds and a smattering of flowers at the tops of the plants when combining starts. Although combining can be delayed until after frost, the frost can accelerate seed shattering and can make the stalks more prone to falling over (lodging). Buckwheat is a crop that should be harvested when ready, rather than letting it stand in the field for a long time. If swathed, buckwheat can be cut a little more green (when about 75% of seeds are brown), and allowed to ripen in the windrow for a few days before picking it up with a combine.

Combine settings for buckwheat vary by machine, but general guidelines are to set fan speed around 600 rpm, with a maximum of 700 rpm. Cylinder speed should be at 400 to 500 rpm, in some cases up to 600 rpm. If seeds going in the hopper are being dehulled, either cylinder speed needs to be slowed or the concaves opened. Concave setting, in general, should be the same as the combine guidebook lists for barley, which will be an opening of 1/2 to 3/4 inch on some combines (for newer John Deere combines use “sector 2” setting). The chaffer (or top screen) should be set to 5/8 to 3/4 inch, while the sieve (or bottom screen) should be at 1/4 to 3/8 inch.

At harvest time, buckwheat seed is usually sufficiently dry to be stored short term with no further drying, provided that green material is minimal in the grain. For long-term storage, buckwheat should be at 15% moisture or below. Most seed moisture testers do not have a buckwheat setting, but in general using a reading for barley will be within 1% ± of the actual buckwheat moisture. Buckwheat can be dried with ambient air or low levels of heat. Since buckwheat groats (the light-colored seed inside the brown hulls) start to darken over time, buckwheat should be delivered to market within a couple of months of harvest if possible.

USDA has no official test weight standard for buckwheat, and it is usually sold on a weight basis, rather than a bushel basis. However, buyers may use test weight as an indicator of seed size and quality. Price may be reduced on buckwheat seed that is below a desired test weight, such as 45 pounds per bushel. Foreign material and weed seed are generally discounted as straight dockage that must be cleaned out before the grain is sold into the food market.

(continued from page 1)
drought tolerant, even though some publications refer to it as such. It is really more of a drought avoider, since it may be maturing after the worst of the summer dry period is over when fall rains may have begun. Buckwheat leaves will often wilt on hot, dry days, only to perk back up at night and appear normal the next morning.

Utilization

Buckwheat is primarily a human food crop, used similarly to cereal grains such as wheat or oats. Even though buckwheat is not a true cereal, it is sometimes called a "pseudocereal." Buckwheat seeds are dehulled and the remaining seed material, called a groat, is ground into flour. The flour is often mixed with flour from other cereal grains to make breads, breakfast cereals or other multi-grain products. In Japan, buckwheat and wheat flour are used to make the popular "soba" noodles. In Russia, where buckwheat is native, it is used in a variety of food products, including roasting the whole groats to make "kasha." Buckwheat is high in lysine, which wheat and corn are low in. The protein content of dehulled buckwheat is about 12%, with only 2% fat.

Although most buckwheat acreage is for food, it does have a variety of other uses. In the past, buckwheat was often fed to livestock, especially hogs, and it is occasionally still used for livestock. Buckwheat has roughly the feed value of oats when fed to livestock. Buckwheat should be mixed with other grains when fed to livestock; this is especially true for light-skinned hogs, which can develop a rash or other complications after eating large amounts of buckwheat. Dehulled buckwheat may be less likely to cause this reaction.

Bee keepers like buckwheat for their foraging honey bees, due to buckwheat's extended flowering period. The resulting honey is dark colored with a distinctly different taste from the more common clover honey. Thousands of gardeners and vegetable growers use buckwheat as a seasonal cover crop. A small, but interesting niche market for buckwheat has been to use the hulls to make buckwheat pillows, popular in Japan, and now being sold in the U.S. Sometimes buckwheat is also sold for wildlife forage plots.

Markets and Economics

Demand for buckwheat grain is solid and steadily improving. The primary demand has come from the export market, but even in the U.S. buckwheat use has risen, in part due to multi-grain baked foods. Japan has been the largest export market in recent years, but other countries, including Russia, have purchased U.S. buckwheat. Buckwheat is sent overseas both as whole seed and in the dehulled form.

Small amounts of buckwheat can sometimes be sold to local bakers or mills, but the bigger buyers are located outside Missouri.

Buckwheat contract prices have held relatively steady, unlike other crops. Contract prices available to Missouri producers have stayed close to $0.10 per pound, priced for local delivery. Contracts have been on an acreage basis, so a grower is not obligated to deliver anything if there is a crop failure. At typical yields of 1,000 to 1,200 pounds per acre, buckwheat grosses from $100 to $120 per acre. Under good conditions, buckwheat can yield up to 1,400 to 1,500 pounds per acre.

Buckwheat income is modest, but production costs are also low, making a net profit feasible. Seed costs about $15 per acre, with additional expense for planting and harvest operations and applying about 50 pounds per acre of nitrogen fertilizer. The other common expense is pre-plant weed control, either through tillage or by use of a burndown herbicide. A net return over variable costs of $20 to $40 per acre is typical, assuming that a good stand of buckwheat is obtained and soil fertility and rainfall are adequate. In northern Missouri, where soybean double cropping is not a good option, buckwheat provides some additional income after wheat where nothing else will. A hidden economic benefit with buckwheat is that it can improve the soil enough to increase yield on the following crop.

Thomas Jefferson Agricultural Institute

Written by Robert L. Myers, Ph.D.
Published by the Jefferson Institute, Columbia, MO, a non-profit research and education center supporting crop diversification (ph: 573-449-3518). Development of this publication was funded by the USDA-CSREES Fund for Rural America program, as part of a cooperative project with the University of Missouri and other universities.

www.jeffersoninstitute.org

Revised 7/02