

Common Buckwheat

Common buckwheat (*Fagopyrum esculentum*) is thought to have originated in central and western China from a wild Asian species *Fagopyrum cymosum*. It has been cultivated in China for over 1,000 years, and was brought to Europe during the Middle Ages. Buckwheat, as well as other grain species, accompanied the colonists to the New World.

The Scots coined the word “buckwheat” from two Anglo-Saxon terms, *boc* (beech) and *whoet* (wheat). The word beech was used since the fruit of the plant was similar to that of beechnut. It was called wheat because the grain of buckwheat was used in the same way as wheat. This term is somewhat ironic since buckwheat does not belong to the grass family and is not considered a “true” cereal.

World acreage of buckwheat has been as high as 5 million acres (2 million hectares). Producers include the former Soviet Union, China, Brazil, Poland, France, Japan, United States, South Africa and Australia. The former Soviet Union (54 per cent) and China (38 per cent) make up the largest percentage of world production.

In Canada, buckwheat production was approximately 150,000 acres (60,700 hectares) in the late 1970's and early 1980's, but has since declined to 30,000 to 40,000 acres (12,000 - 16,000 hectares) annually. Manitoba is the major producer of buckwheat in Canada with 70 per cent of the acreage on average, followed by Quebec at 16 per cent and Ontario at 14 per cent. In Alberta, the annual acreage has been 500 acres (200 hectares) for a number of years. The Canadian 1993-95 yield average was approximately 21 bushels per acre; however, the long-term information from 1981-91 shows average yields closer to 16 bushels per acre.

Description

Buckwheat is an annual, characterised by large heart-shaped leaves. The tall, erect plant can grow from 2 to 5 ft. (.6 - 1.5 m) in height and can produce several branches (Figure 1). Stems are hollow and the plant is very prone to

lodging. Stems vary in colour from green to red and brown at maturity. Buckwheat has a shallow tap root system, with numerous laterals extending to 3 to 4 ft. (9 - 1.2 m) in depth.



Figure 1. Buckwheat is an annual

The fruiting structure of buckwheat is on axillary or terminal racemes with densely clustered flowers (Figure 2). Flowers can be white or white tinged with pink. Seeds are wide at the base and triangular to almost round in cross section. Seed colour may be brown, grey-brown or black while size varies according to variety. The seed is comprised of a thick outer hull and an inner groat.



Figure 2. Buckwheat has densely clustered flowers

Buckwheat has an indeterminate growth habit, so the crop does not mature uniformly. Plants will begin to blossom 5 to 6 weeks after sowing and will mature in 80 to 90 days. Buckwheat requires cross pollination to produce seed, so insect pollinators are essential for effective fertilization and seed set. Manitoba research recommends one honey bee colony per acre.

Adaptation

Buckwheat thrives in cool, moist climates. It is not frost tolerant. Because of its short growing period, buckwheat is well adapted to Canadian conditions. High temperatures and dry conditions during flowering may cause some flower blast and lower yields. Cool evening temperatures and high humidity favour buckwheat growth.

Buckwheat can be grown on a wide range of soil types, but it is best suited to light and medium-textured soils, such as sandy loam, loam and silt loam. Clay soils and highly fertile soils should be avoided. Buckwheat is as acid tolerant as oat or potato. Liming soils above a pH of five should not be necessary. Studies in western Canada have shown an early growth-stage tolerance to saline soils; however, as the crop matured, this tolerance lessened.

Growers in areas with frequent heavy rain and strong wind should consider the risks in growing buckwheat. It is very susceptible to lodging because of its hollow stem and is easily flattened by high wind and heavy rain.

Properties and uses

In Canada, buckwheat has been grown primarily for grain for domestic and export purposes. Throughout history, this crop has had a number of uses: food for humans, feed for livestock, a honey crop, smother and green manure crop.

Buckwheat is also harvested green for rutin extraction. Rutin, a flavonol glycoside compound, is used in medicine to check blood vessels for haemorrhagic diseases and to treat high blood pressure. The leaves of buckwheat contain the highest level of rutin.

Canadian processors use buckwheat in pancake mixes, breakfast cereals, breads and poultry stuffing. Europeans use whole groats in porridges, soups and breakfast cereals. Japan is the largest customer for Canadian buckwheat. Processors in Japan grind buckwheat into flour and combine it with wheat flour to produce “Soba” or buckwheat noodles. The term “Soba” is simply the word for buckwheat. Japanese consumers are very particular about the quality of Soba noodles, and only new crop buckwheat has the desired colour and flavour.

Buckwheat grain is of lower quality than cereal grains when used for livestock feeds and is usually fed in combination with barley, oats or corn. Whole grain protein is approximately 11 per cent, with 2.5 per cent fat. Buckwheat contains over 1 per cent of three amino acids: glutamic acid, arginine and aspartic acid.

The middlings from buckwheat grain are rich in protein, fat and minerals. Generally, middlings are fed only as a concentrate. The protein content of middlings is approximately 27 per cent and fat 7 per cent. The palatability of this product is poor, and it is not fed to swine.

Buckwheat produces a dark, strong-flavoured honey, which is usually sold for a premium. One acre (.41 ha) of buckwheat may produce up to 150 lb. (65 kg) of honey per growing season.

Buckwheat has also been used as a smother crop for controlling weeds such as quack grass, Canada thistle, sow thistle, leafy spurge and Russian knapweed. The crop’s rapid germination and growth and broad-shaped leaves, which shade early in the crop’s development, smother most weeds. Buckwheat is not a good choice for a cover or companion crop. It has also been used as a green manure crop because of decent yields of dry matter in a short time.

Agronomy

Varieties

Tokyo was one of the first varieties developed in Canada. This small-seeded diploid type has a Japanese line as a parent; however, demand by the Japanese market for large-seeded types encouraged Agriculture Canada at Morden, Manitoba, to develop and release **Mancan** in 1974. **Mancan** is a large-seeded diploid type with good market acceptability but low test weight. The 1,000 kwt of this variety is 29 grams.

Manor, another large-seeded diploid variety, developed by the Agriculture Canada Research Station at Morden was released in 1980. The 1,000 kwt of Manor is also 29 grams. **AC Manisoba**, a higher-yielding extra large-seeded variety was brought forward from Agriculture Canada at Morden in 1995. AC Manisoba has a 1,000 kwt of 35 grams.

The following information on varieties has been provided courtesy of Manitoba Agriculture.

- **AC Springfield** – This large seeded variety has larger seed than Mancan and Manor, having 35.7 g/1000 seed compared to 29.6 g and 28.6 g, respectively. It has a higher percentage of large, whole groat after dehulling. Its yielding ability is intermediate to Mancan and Manor. Seed density is low at 523 kg/m³, compared to 557 kg/m³ for Mancan, and 570 kg/m³ for Manor. About two per cent of the seed has a winged extension of the hull.
- **Koban** – This large seeded variety is higher yielding, has greater seed density and contains higher protein than AC Manisoba. Seed is dark brown to black.
- **BM 94362.3** – This large seeded variety has higher yields, increased seed density, 1000 seed weight (36.9 g compared to 34.2 g) and earlier maturity than AC Manisoba. Seed density is high at 621 kg/m³ compared to 557 kg/m³ for Mancan and 570 kg/m³ for Manor. Its protein content is slightly lower than AC Manisoba. The seed is very dark brown to black.
- **BM 94199.1** – This large seeded variety has higher yields, increased seed density, 1000 seed weight (37.3 g compared to 34.2 g) and earlier maturity than AC Manisoba. Seed density is similar to BM 94362.3. Its protein content is slightly lower than AC Manisoba. The seed is very dark brown to black.
- Ever since their introduction, large seeded varieties have encountered problems in the marketplace. First, their low bushel weight has been mistaken for poor quality. But large seeded buckwheat is characteristically light in bushel weight because of its size and shape. Secondly, Canadian large seeded varieties are typically light to dark brown, not black. Light coloured kernels thus have mistakenly been thought to be immature. When harvesting weather is excellent, mature buckwheat has this range of color, with good green testa immediately below the brown husk.
- The newer varieties, BM94362.3 and BM94199.1, have very dark brown to black seed, which is plump and somewhat round. The difficulties in marketing, which arise from misunderstandings over bushel weight and color, should be avoided with these new varieties. Furthermore, the amount of groat from plump, round seeds should please processors.

- Earlier large seed varieties had winged extension of the hull. Japanese buyers dislike this feature and refer to such buckwheat as “oni,” which means devil, perhaps because these kernels resemble a small devil’s face. Such buckwheat has less groat and little value for processors. With later large seeded varieties, the winged extension has been eliminated.

As Alberta Agriculture, Food and Rural Development does not conduct variety testing of buckwheat, visit Manitoba Agriculture’s web page for the most up-to-date variety information at <<http://www.gov.mb.ca/agriculture/crops/specialcrops/pdf/bib01s08.pdf>>

Seeding

A firm moist seedbed is required for uniform rapid emergence. The seed should be placed between 1.5 inches (4 cm) to 2.5 inches (6 cm) deep. The deeper seeding depth should only be used under drier conditions. Deep seeding delays emergence and decreases uniformity of the crop. Buckwheat will germinate at soil temperatures as cool as 7° C.

Seed size ranges from 29 to 35 grams per 1,000 kernels, and the recommended seeding rate ranges from 35 to 72 lb/ac (39 - 81 kg/ha). The heavier rate should be used in fields where weed populations are higher than desirable and where larger-seeded varieties are being grown. Lighter seeding rates may be used on cleaner fields. Too heavy a seeding rate may be detrimental, as overly thick stands produce spindly plants with short stems and few seeds. A plant population of approximately 16 plants per square foot is desirable. Buckwheat does exhibit a high degree of plasticity, branching profusely to compensate for lower plant populations.

The seeding date for buckwheat will vary slightly from region to region depending on the date when the risk of the last spring frost has passed. The range for seeding dates in western Canada varies from June 1 to June 25. In the central, north central and northern parts of Alberta, seeding dates past June 15 risk the possibility of damage to the crop caused by early fall frost. Seeding past this date is not generally recommended. Early June seeding has produced the highest buckwheat yields.

No specialized seeding equipment is required for buckwheat although some time may have to be taken for calibrating grain drills that do not have a buckwheat chart.

Rotations

Cereal grains in a buckwheat sample are undesirable from a marketing standpoint because they are hard to clean out. Barley, oat, wheat, rye and triticale are considered foreign material in buckwheat, and samples containing more than 5 per cent cereal grain by weight are graded “sample.” Unless very good control of these plants can be accomplished prior to seeding, growing buckwheat is not recommended.

Avoid growing buckwheat on canola or mustard stubble because of their volunteering habit and competitive nature. Buckwheat grows well on field pea or dry bean stubble or summer fallow. Volunteer buckwheat in a succeeding crop may be a problem. Check rotations to see if the crop following buckwheat can be sprayed to control volunteer plants.

Fertilization

Buckwheat responds well to a balanced fertilizer program, but it is not considered a high nutrient user. A soil test to determine what nutrient levels are present is critical. Early research on buckwheat fertility requirements showed that highly fertile or rich soils should be avoided. Excessively high nitrogen levels in the absence of other nutrients compound the lodging problem. Growers using animal manures have had severe lodging problems.

General recommendations for added nutrients are as follows: 20 to 40 lb/ac (22 - 45 kg/ha) nitrogen, depending on whether the crop is planted on summer fallow, pulse stubble or cereal stubble. Normal rates for phosphate range from 27 to 40 lb/ac (30 - 45 kg/ha). Potash is generally recommended if the crop is grown on sandy loam soils. The suggested rate for potash in these cases would be 31 to 62 lb/ac (35 - 70 kg/ha). When sulphur is required, apply 13 lb/ac (15 kg/ha). No more than 5 lb/ac (5.6 kg/ha) nitrogen and 20 lb/ac (22 kg/ha) phosphate should be applied with the seed.

Harvesting

Buckwheat has an indeterminate growth habit. The plant matures from the bottom upwards, flowering until cut or killed by a frost. At harvest, mature seed, immature seed and a few flowers will be present. A grower must determine when to start harvest before losses occur due to shattering.

Harvest should begin when 75 per cent of the seeds have reached physiological maturity, and the plants have lost a majority of their leaves. This stage corresponds with the time the lower seed heads begin to shatter. Buckwheat may be swathed or straight combined. Either operation must be done carefully since aggressive reel action can cause additional shattering. Adjusting the reel speed to

match the forward speed of the swather or combine may help. A draper-type pickup on the combine causes less shattering than a drum type.

Cylinder concave clearance and cylinder speed must be adjusted to minimize excessive cracking and de-hulling. Cylinder speeds are generally set at 600 to 800 rpm. If seed damage is occurring, slowing the cylinder speed and/or opening the concave clearance will help. Front cylinder concave clearance of 1/2 to 3/8 of an inch and 1/4 inch at the rear is recommended. Upper sieve openings should be in and the lower 5/16 inch.

The wind setting should be set to allow the maximum amount of foreign material through without buckwheat passing through. Straight combining an indeterminate crop such as buckwheat will result in a sample containing dry mature and tough immature seed.

Storage

Grain drying or aerating may be necessary. Combining the crop at slightly higher moisture will result in less shattering. A safe temperature for grain drying, for both seed and commercial grain, is 45° C. Buckwheat can be safely stored at 16 per cent moisture. The bushel weight of buckwheat is 48 lb. Growers are not allowed the luxury of long periods of storage before marketing since buckwheat contains a high percentage of fat.

Pest management

Weeds

Very few herbicides are available for weed control in buckwheat. Clean fields are highly desirable. Volunteer plants of canola, mustard, barley, oat and wheat can be serious weed problems in buckwheat. Hoe Grass 284® is registered for control of wild oats and green and yellow foxtail. The crop tolerance is rated 8.6 out of 9. Poast® is also registered for grass weed control.

There are no broadleaf herbicides registered for buckwheat. Some broadleaf herbicides used in previous crops may present residual problems in buckwheat. Residues from herbicides such as Ally®, Lontrel®, Pursuit® and Tordon 22K® could cause damage. Canada thistle, sow thistle, toadflax and quack grass should be sprayed with pre-harvest glyphosate the year prior to growing buckwheat. Cultural control is often used to achieve weed control. Since buckwheat is planted somewhat later in the season, a number of tillage operations are possible prior to seeding.

Diseases

There are few reports of diseases in buckwheat. Leaf spot caused by a fungus called *Ramilaria* can occur. *Rhizoctonia* (root rot), downy mildew and aster yellows have also been found. None of these diseases is of any economic importance.

Insects

Japanese beetles, aphids, cutworms and wireworms have all been reported in buckwheat. Japanese beetles do the most damage, attacking the flower head and can cause major economic loss on occasion.

Marketing

The Japanese market requires new crop buckwheat for Soba noodles. Because of this need, growers are not allowed the luxury of long periods of storage before marketing. New crop buckwheat groats are white with a greenish tinge, whereas old crop buckwheat is reddish-brown to grey. Buckwheat flour contains a high percentage of fat, and flour will become rancid if stored for long periods.

Grading standards consider kernel size and a No. 8 slotted sieve is used. At least 80 per cent of the kernels must remain on top of the No. 8 sieve, or the sample is considered small-seeded, i.e. Canada No.1 Small.

To obtain a Canada No. 1 grade, a number of other criteria must be met:

- minimum test weight of 58 kilograms per hectolitre
- less than 1 per cent of the grain sample de-hulled with a maximum 4 per cent damage
- no more than 1 per cent foreign material allowable.

Also, degree of soundness is judged. The sample must be well matured, cool and sweet to meet the Canada No. 1 grade. Prices received for buckwheat fluctuate between \$8.00 and \$9.00 per bushel, and a majority of Canada's crop is exported. Production contracts are available and provide security for marketing.

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