



Mustard

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There are three types of mustard, yellow, brown and oriental. Yellow mustard (*Brassica hirta*) is the most commonly grown in North Dakota. Only small acreages of brown and oriental (*Brassica juncea*) are grown in North Dakota. Yellow mustard is used mainly to produce "mild" prepared mustard for table use. It is also used in salad dressings, pickles and processed meat products. Brown and oriental mustard are used mainly for "hot" table mustard, and some for oil and spices.

Amount of mustard planted in North Dakota has been in the range of 10,000 to 60,000 acres. North Dakota mustard acreage was 10,000 in 1990 and 14,000 in 1991, compared to 19,691 acres in the United States in 1987. Harvested wheat acreage in 1991 for North Dakota was 9.8 million and 57.7 million for the United States.

Adaptation

Mustard is best adapted to fertile and well-drained soils. Avoid dry, sandy loam soils. Mustard has some tolerance to salinity and is similar to barley in its productivity on saline soils. Yellow mustard varieties mature in 80 to 85 days; the brown and oriental types require about 90 to 95 days to reach maturity.

Seedbed Preparation

A seedbed for mustard should have no previous crop residue and be firm and fairly level. Shallow tillage, deep enough to kill weeds, will keep soil moisture close to the surface and leave the seedbed firm. This will permit shallow seeding and encourage rapid, uniform emergence. Seedbeds should be packed before planting with a roller packer, empty press drill or rodweeder.

Some producers are successfully planting mustard into standing small grain stubble and into minimum tilled stubble. The firm moist seedbed has been providing good stands.

Varieties

Yellow mustard varieties tend to be shorter, earlier maturing, and lower yielding than brown or oriental varieties. The various seed varieties are available from contracting firms. Varieties of yellow mustard include Gisilba, Ochre and Tilney. Oriental mustard varieties include Cutless, Forge and Lethbridge 22. Brown mustard varieties include Blaze and Common Brown.

Seeding Date and Rate

Early seeding is recommended, but seeding should be late enough to avoid damage from spring frost just after emergence. Seeding should occur from May 1 to 25. Seeding later than May 15 usually results in lower yields.

Yellow mustard is solid-seeded with a grain drill at 10 to 14 pounds per acre. The higher rate should be used on heavy, fertile soils or on soils with emergence problems. Oriental and brown mustards should be solid-seeded at 6 pounds per acre. Mustard seeds are small and must be planted in a moist, firm and shallow seedbed (1/2 to 1 1/2 inches deep) to ensure rapid germination and emergence.

Growth Characteristics

Mustard seedlings emerge rapidly but tend to grow slowly after emergence. Under favorable moisture and temperature conditions, the ground will be covered in four or five weeks.

Five weeks after emergence, the plant will begin to bud. At this stage, the crop will appear rather uneven. A week to 10 days later the plant will develop into full yellow bloom and the stand will appear more even. Good moisture supplies favor a long blossoming period, and longer blooming periods result in higher yield potential. Full-grown plants vary in height from 30 to 45 inches, depending on type, variety and environmental conditions.

Fertilizer

Mustard's response to nitrogen and phosphate fertilizer is similar to that of cereal grains. Avoid using more than 10 pounds of actual nitrogen per acre, as seed germination injury can occur. Some growers mix low rates of phosphorus fertilizer with mustard seed and plant them together. Potash is rarely needed to increase mustard yields.

Weed Control

Weed control is important for successful mustard production. In the early stages of growth, young mustard seedlings do not compete well with weeds. However, once the plants are established they grow rapidly and shade out weed growth below the leaf canopy. Tame mustard is highly susceptible to many herbicides used to control broad-leaved weeds in cereal crops. Special precautions are necessary to avoid spray drift of these herbicides to mustard crops when spraying adjoining cereal crops. The herbicides trifluralin and carbyne are recommended for weed control in mustard crops.*

Insects

Insects can cause serious yield losses, so growers should monitor fields closely for problems. Flea beetles and diamondback moth caterpillars have been the most troublesome insects. Overwintered flea beetles may attack the crop as soon as the young seedlings emerge from the ground. The insects chew tiny holes in the leaves and give the plant a shot-holed appearance. Where infestations are heavy, crops can be severely damaged or even destroyed.

Cultural methods can help to reduce plant losses from flea beetles. A firm seedbed that is well tilled and adequately fertilized will help plants to outgrow beetle damage during the susceptible early season stages. The use of malathion will control flea beetles and the diamondback moth caterpillar.*

**For information about your local area, contact your county extension agent.*

Diseases

Several diseases attack mustard. Among the most serious are downy mildew, white rust, sclerotinia stalk rot (white mold), leaf spot and virus mosaic. Do not include mustard in crop rotation systems containing crops such as sunflower, rapeseed, dry edible beans, crambe or safflower. These crops have similar disease problems and disease infestations can build to costly levels. Mustard grown in a small grain rotation is one of the best preventatives of serious disease problems and provides an excellent biological break for cereal grain leaf diseases.

Harvesting

Wind, rain and normal drying generally do not cause mustard to shatter before cutting. But when the crop is overripe, actual harvesting operations can cause severe shattering losses. Yellow mustard can be straight combined if the crop has matured uniformly and is free of immature weeds. Full-seed maturity (no green seed) is necessary to produce a good quality sample. The reel may cause shattering during straight combining, but it can be removed or lifted above the crop if the stand is good. If the reel is needed, it should be reduced in speed and half the bats removed. Many growers of yellow mustard prefer to straight combine while the crop is still tough (12 to 13 percent moisture) and artificially dry. This gives seed of uniform quality.

Brown and oriental mustard varieties are generally more susceptible to shattering than the yellow types and are usually swathed. Brown and oriental mustard grow taller than yellow mustard, so the cutting height is higher. Swathing should begin when about 75 percent of the seeds have reached their mature color (yellow or brown). To minimize shattering losses, swathing should be conducted under conditions of higher humidity.

Yields

Yields on yellow mustard varieties at the Langdon Experiment Station have averaged 1,300 pounds per acre. Brown and oriental mustard varieties vary in yield from 1,500 pounds per acre for brown to 1,600 pounds per acre for oriental. However, a more realistic yield expectation for commercial production is 985 pounds per acre for yellow, 1,150 pounds per acre for brown, and 1,220 pounds per acre for oriental.

Storage

Mustard seed can be stored safely when the moisture content is 10 percent or less. Care should be taken to avoid cracking the seed while moving the crop in and out of storage. Cracked seed ends up as dockage and a loss to the producer. When drying, it is essential not to exceed air temperatures of 150 degrees Fahrenheit or seed temperatures of 120 F. Tight bins, free of cracks or holes, are essential for storing mustard.

Uses

Yellow mustard is mainly used in the meat packing industry as an aid to flavor, emulsification, water binding, slicing and texture in hot dogs, bologna and other processed meats. Ground yellow mustard can absorb excess fat and fluid (approximately 4.5 times its own weight) and is also used with seasoned hamburger, meatloaf, liver sausage, chili, various canned meat products, and some table mustards.

Oriental mustard is used mainly in low grade Chinese mustard. Some spice blending houses also use it as an ingredient for its hot, pungent flavor. It is an essential ingredient in mayonnaise, salad dressings, barbecue sauce, baked beans, steak sauces, relishes and many other sauces.

Brown mustard has limited uses in hot, spicy table mustards.

Economics of Production and Markets

Mustard is produced as a specialty grain and should be grown under contract to guarantee a selling price and market for the producer. The grower makes a contract with the shipper to supply seed of a specified quality for delivery at a future date. Contract prices (with Minn-Dak Growers) for yellow mustard seed for 1992 were 11.5 cents per pound (up to 600 pounds per acre), 10.5 cents per pound for oriental, and 10 cents per pound for brown (up to 800 pounds per acre). Mustard production over the contracted amount is not guaranteed a selling price but depends on market demand. The number of alternative markets are limited when a surplus is produced.

Mustard contracts are made from January through mid-May. Primary growing regions in North Dakota are north of Highway 2 and east of Highway 83 for yellow mustard, and west of Highway 83 for oriental and brown mustard. Contracts are based on yield and grade of the mustard. Major counties that produce mustard are Bottineau, Burke, Cavalier, Ramsey, Sargent and Towner.

Of the six commercial mustard flour mills in the world, Grand Forks, North Dakota, is the home of two. The other four flour mills are located in Berlin, Wisconsin; Springfield, Missouri; Hamilton, Ontario; and Norwich, United Kingdom.

Consumption of mustard has been steady, and growth of the mustard market is directly related to population growth. This stability of demand is due to the lack of any real mustard substitutes. Consumers will not substitute other products for mustard, as this would not save money.

United States Production

In 1987, the latest year for which data are available, mustard seed was grown in the United States on 172 farms with 19,691 acres: North Dakota and Montana accounted for about 56 and 28 percent of the output, respectively. Other states producing mustard include South Dakota, Washington and Oregon.

United States Imports

From 1989 to 1990, U.S. imports of whole mustard seeds increased from 102 million to 122 million pounds and were valued at \$12 million to \$17 million. Canada supplied virtually all of the imports. U.S. imports of ground and prepared mustard remained relatively constant at 8 million and 7 million pounds, respectively. The value of ground mustard increased by \$300,000 to \$3.9 million, and prepared mustard increased by \$350,000 to \$5.9 million. Canada supplied approximately 80 percent of the imports.

United States Exports

From 1989 to 1990, U.S. exports of mustard seed increased from 2 million to 3.6 million pounds and were valued at \$500,000 to \$600,000. Ground and prepared mustard exports increased from 3 million to 6 million pounds and were valued at \$1.8 to \$3.4 million. In 1990, approximately 50 percent of mustard seed and 26 percent of ground and prepared mustard was exported to Canada.

Estimated 1993 Economic and Cash Flow Budgets for North Dakota

	Yellow Mustard		Oriental Mustard		Brown Mustard	
	Economic Cost/Acre	Cash Cost/Acre	Economic Cost/Acre	Cash Cost/Acre	Economic Cost/Acre	Cash Cost/Acre
MARKET INCOME		(985 lbs)		(1,220 lbs.)		(1,150 lbs.)
	107.37	107.37	124.44	124.44	115.00	115.00

DIRECT (VARIABLE) COSTS						
Seed	3.60	3.60	1.80	1.80	1.80	1.80
Herbicides	6.24	6.24	6.24	6.24	6.24	6.24
Fertilizer	8.21	8.21	11.32	11.32	10.39	10.39
Fuel & Lubrication	5.40	5.40	5.50	5.50	5.47	5.47
Repairs	8.19	8.19	8.23	8.23	8.22	8.22
Miscellaneous	1.05	1.05	1.05	1.05	1.05	1.05
Operating Interest	1.55	1.55	1.62	1.62	1.58	1.58
SUM OF LISTED DIRECT COSTS	34.24	34.24	35.76	35.76	34.75	34.75
INDIRECT (FIXED) COSTS						
Miscellaneous Overhead	3.56	1.94	3.61	1.95	3.59	1.94
Machinery Depreciation	14.39	xxxx	14.51	xxx	14.47	xxx
Machinery Investment	6.91	14.04	7.00	14.23	6.97	14.17
Land Taxes	3.92	3.92	3.92	3.92	3.92	3.92
Land Investment	26.66	12.01	26.66	12.01	26.66	12.01
SUM OF LISTED INDIRECT COSTS	55.44	31.91	55.70	32.11	55.61	32.04
SUM OF ALL LISTED COSTS	89.68	66.15	91.46	67.88	90.36	66.79
RETURN TO LABOR & MANAGEMENT	17.69	xxx	32.98	xxx	24.64	xxx
NET CASH FLOW	xxx	41.22	xxx	56.56	xxx	48.21
LISTED COSTS PER UNIT (LB):						
Direct Costs	0.03	0.03	0.03	0.03	0.03	0.03
Indirect Costs	0.06	0.03	0.05	0.03	0.05	0.03
Total Costs	0.09	0.07	0.07	0.06	0.08	0.06

The economic budget is generated by charging market rates for all resources needed for production. It helps answer the question "Is this enterprise profitable?" The bottom line represents a return to labor and management.

The cash flow budget is an estimate of the out-of-pocket cash needed to run the enterprise, including not only direct costs but indirect cash costs such as principle and interest payments, insurance and taxes. It helps answer the question "Can I make meet my cash obligations if I go into this enterprise?" Total cash expenses are subtracted from total cash receipts to calculate the net cash which is available for family living and other needs.

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