

## **YELLOW MUSTARD PRODUCTION IN SEMIARID OREGON**

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### **INTRODUCTION**

Mustard (*Sinapis alba*) is a cool season, spring annual, tap-rooted, broadleaf plant. It is presumed to have its origins in the Middle East region. Mustard has been cultivated for at least 4,000 years as an oil, spice, and medicinal plant. It was introduced into Western and Northern Europe in the early Middle Ages and has been cultivated not only for seed, but also used as a forage, green manure, and garden crop.

Three types of mustard: yellow, brown and oriental are grown as a cash crop. Yellow mustard is the most common type grown in North America. It is used for condiment or "hot-dog" mustard, while brown and oriental are used for oil and spices. Mustard is typically grown under contract because the market demand is small and consequently prices can range widely. Contracts assure producers a market source at an established price.

Mustard is adapted to fertile, well drained soils and yields best when water and fertility are adequate. It is tolerant to salinity and similar to barley in productivity on saline soils. Varieties of yellow mustard mature in about 85-90 days. Mustard is an excellent rotation crop with small grains because it disrupts many weed and disease problems common to cereals.

### **GROWTH HABIT**

Yellow mustard is a spring annual broadleaf with a well defined tap root.

Mustard emerges rapidly (5-10 days) and grows quickly under favorable moisture and temperature conditions. Crop canopy will completely cover the ground about 30 days after planting. At approximately 35-40 days after sowing, plants begin to bud and 5-7 days later flowering begins. Full bloom is reached 7-10 days after flower initiation. Adequate water and cool temperatures (<85° F) favor a long bloom period (>15 days). Seed yield is directly related to length of bloom. Mature plants vary in height from 30 to 45 inches depending on genetic potential and environmental conditions. Small grain crops following mustard generally yield better than following small grains because of rotation benefits. Crops such as sunflower, Canola, safflower, crambe, dry bean and soybean are not recommended in close rotation with mustard, as they are all susceptible to *Sclerotinia* (white mold).

### **SOWING CONSIDERATIONS**

Several factors must be considered and/or adjusted to establish a vigorous stand of yellow mustard. These include herbicide history, seedbed preparation, choice of seeding equipment, row spacing, seeding depth, seeding rate and seeding date.

**Herbicide History** A major consideration in growing yellow mustard is residual effects of soil-active sulfonyl-urea herbicides. This includes products such as Finesse®, Amber®, Glean® and Ally®. These products have fairly long plant back periods for broadleaf crop such as yellow mustard. Check your field records and consult your supplier and the label of the specific product for plant back restrictions.

**Seedbed Preparation** Generally, seedbeds for mustard are similar to those required for small grains. The soil should be

firm and fairly level. Tillage should be just deep enough to kill weeds, but keep soil moisture close to the surface and leave a firm seedbed. It may be necessary to roll or pack the seedbed (before or after sowing) if the soil is loose or uneven or if soil moisture is variable.

**Sowing Depth, Seed Placement and Row Spacing** Seed depth depends on seedbed, soil and weather conditions and type of seeding equipment available. Ideally, mustard should be sown no deeper than necessary to achieve good seed soil contact and placement into firm moist soil with a minimum of soil cover. When sowing with a disk or hoe drill, place seed 1/2 to 1 inch deep into moist soil and press over the row. Uniform seed depth will assure even, vigorous emergence. Mustard can be successfully planted into small grain stubble, provided seed makes good contact with moist soil and is not more than 1.5 inches deep. Disk and hoe drills or air seeders can be used to seed mustard but uniform depth control is critical for seed placement. Soil crusting prior to seedling emergence can cause problems. If mustard stands are poor (<4-5 plant/ft<sup>2</sup>, 10 days after planting), replanting should be made rapidly.

As with all spring crops, uniform competitive stands are important. For this reason it is best to plant mustard at narrow (6-7 inch ) row spacing. However, row spacings up to 12 inches wide can be used, but canopy closure will not occur as quickly. Therefore weed competition and evaporative water loss may be greater. Row spacings wider than 12 inches are not recommended.

**Sowing Rate and Date** Yellow mustard has about 100,000 seeds per pound and should be sown at a rate of 8-12 pounds per acre. Higher rates should be

used where seedbed conditions are poor or emergence may be a problem. In research trials, we have consistently achieved adequate stands with 7 lb/acre. Mustard should be sown promptly when the soil temperature in the seedbed consistently exceeds 40° F. Generally, at Pendleton, 40° F is reached about mid March. Delayed plantings can run into problems with shortened flowering periods because of late season heat stress.

## PLANT VARIETIES

Commercially available varieties of yellow mustard include Gisilba, Ochre, and Tilney. Generally, variety selection is determined by the contractor. There are quality considerations that are important to processors that make certain varieties more desirable than others. Needing a uniformity and consistent supply, contractors offer contracts to grow specific varieties. Varietal information derived over the 1995-1996 growing seasons appears in Table 1. Mustard was grown after fallow and after a previous crop of winter wheat at both the Sherman and Pendleton research farms in 1995 and 1996. The trials included 27 and 12 varieties respectively in each year. These experiments were part of a regional mustard variety testing and breeding program operated by Dr. Jack Brown from the University of Idaho. Varieties not shown in Table 1 are experimental breeding lines, which are not commercially available.

## FERTILIZATION

Mustard responds to nitrogen, phosphorus and sulfur fertilizer in a manner similar to small grains or spring Canola. As with small grains, nitrogen is the nutrient needed in the greatest quantity. Because yellow mustard is a new crop in this area little information is available on nitrogen

Table 1 Yield of yellow mustard at Pendleton and Moro under fallow and annual crop. 1995-96

Pendleton					Sherman				Average All Sites	
annual crop			fallow		annual crop		fallow			
Gisilba	Rank/27	Yield lb/acre	Rank/27	Yield lb/acre	Rank/27	Yield lb/acre	Rank/27	Yield lb/acre	Rank/27	Yield lb/acre
1995										
	8	1565	4	1465	9	1264	20	1129	6	1356
Kirby	1	1789	1	1712	5	1308	1	1480	1	1572
Ochre	7	1579	6	1387	1	1471	15	1180	3	1404
Tilney	27	1347	20	1098	27	1077	2	1365	21	1222
Trial		1379.17		1276.17		1185.82		1256		1371
Average										
1996										
	Rank/12		Rank/12		Rank/12		Rank/12		Rank/12	
Gisilba	2	859	3	1148	6	579	8	1110	4	924
Kirby	7	730	1	1218	2	621	2	1220	1	947
Ochre	8	684	4	1119	7	577	9	1047	9	857
Tilney	3	815	7	1083	5	584	3	1155	5	909
Trial		717		1058		563		1075		
Average										

fertility rates. The fertilizer guide *SF 718 Fertilizing Mustard, Canola and Crambe* Dahnke, et al. 1992) from North Dakota (a mustard producing area) recommends 6.5 lb N/100 lb of expected seed yield. Table 2 is based on the North Dakota recommendation.

Phosphorus and sulfur should be added according to the recommendations for spring wheat. Spring crops respond to these nutrients particularly in an annual crop rotation. A general recommendation or maintenance application is 20 lb P<sub>2</sub>O<sub>5</sub> and 10 lb S/acre. Mixing low rates of phosphorus fertilizer (<100 lb/acre 16-20-0-14) with mustard seed and planting them together has been used effectively. However, the combination must be thoroughly mixed and remain unseparated to assure uniform seeding.

Table 2. Nitrogen fertilization rates for yellow mustard in North Dakota (Dahnke, et al. 1992)

Expected Yield lb/acre	Soil N-NO <sub>3</sub> + Fertilizer N lb/acre
1000	65
1500	100
2000	130
2500	165

## WEED CONTROL

Weed control must be based on clean field selection and shallow seeding for quick and uniform emergence to obtain a uniform stand. Weeds have not been a serious problem in mustard production. However weed seeds of similar size and shape as mustard can cause cleaning losses and market grade reductions. Such losses reduce profits to the grower. Weeds growing as an understory in a mustard crop do not reduce yield. However they may contribute seed to perpetuate the weed problem. Mustard plants are sensitive to herbicides such as 2,4-D, Banvel, and MCPA. Spray drift must be avoided.

## INSECTS

Insects have not caused serious problems on yellow mustard in this region. However as acreage of mustard increases fields should be monitored for potential problems. Flea beetles and diamondback moth caterpillars are the most likely insects to cause damage. Adult flea beetles feed on the cotyledons and first true leaves, causing a shot holed appearance. Severely damaged seedlings may die, while less seriously damaged plants often suffer a reduction in vigor and stamina. Hot, sunny weather is conducive to feeding activity, while cool, damp weather slows feeding and favors crop growth. Once the crop advances beyond the seedling stage, serious damage is rare because mustard can outgrow the beetle defoliation.

Diamondback moth caterpillars attain a length of ½ inch and are light yellowish green to green. The larvae eat leaves, flowers and green pods and are extremely active when touched.

## DISEASES

Mustard grown in rotation with small grains is relatively free of disease. Sclerotinia stalk rot (white mold) is the only disease that has been observed on mustard in this area. It has only been present at very low levels. However, mustard should not be grown in short rotation with Canola, dry edible bean, crambe, or safflower. These crops have a similar problem with white rot and the problem could build to economic levels. Mustard grown in rotation with small grain is a preventative of serious disease problems and provides an excellent biological break for cereal root diseases.

## HARVESTING AND SEED QUALITY

Wind, rain, and normal drying generally does not cause mustard to shatter before cutting. Yellow mustard can be direct combined, if the field is not weedy and the crop is uniformly ripe. The harvest operation can cause some shatter if the crop is overripe or extremely dry. When direct combining, wait until the crop is mature and dry. The reel can be removed or lifted above the crop if the stand is good. If the reel is needed, it should be operated at a reduced speed.

The combine should be adjusted so that the seeds are completely threshed while using the lowest possible cylinder speed. Cylinder speed should be set at approximately 600 RPM. Careful adjustment of the cylinder speed and cylinder opening is important to avoid cracking. To test for cracking, run your hand into the threshed seed. If cracked mustard is present, it will adhere to the hair on the back of your hand, indicating the need for further combine adjustment. Cracked seed is considered dockage and is a loss to the producer. Cylinder speed may need to be varied during the day as crop moisture content varies. Fan speed should be reduced to limit seed loss, yet maintain sufficient air to ensure clean seed.

## LITERATURE CITED

Dahnke, N.C., C. Fanning, A. Cattanach, and L.J. Swenson. 1992. Fertilizing Mustard Rapeseed, Canola and Crambe, North Dakota State University Extension Service Publication SF718.