

Western Region



Sustainable Agriculture
Research and Extension

Alternative Crops for Dryland Agriculture in the Intermountain Pacific Northwest

GROWER EXPERIENCES WITH MUSTARD AND CANOLA IN EASTERN WASHINGTON, 1997–2000

By Norm Herdrich, Agricultural Writer

This information was gathered from two workshops held in Washington State in February 2000. Speakers included Jack Brown, Aaron Esser, Ron Jirava, Hal Johnson, Chris Laney, Brian Van Pelt, and Don Wysocki.

Canola, or edible rapeseed, along with the Oriental and brown mustards are members of the *Brassica* family. Yellow mustard is in the *Sinapis* family, and is closely related to the *Brassicacae*. These crops have well-defined advantages in a crop rotation in that they can reduce use of agricultural chemicals and reduce erosion. They may also provide an economic alternative to peas and lentils, two crops with greatly expanded production internationally.

There are two types of Canola—*Brassica napus* or Argentine types, and *B. rapa* or Polish types and two types of mustards. The Oriental and brown mustards are in the *B. juncea* family, while the yellow mustard is *Sinapis alba*. The brown mustards are used to make Dijon-type condiment mustards.

There is a growing market for Canola in the United States. About 94% of the Canola used domestically is imported. Furthermore, the trend in the United States is toward the use of more Canola oil in cooking in place of the soybean and corn-based oils.

ADVANTAGES OF BRASSICAS

- Beneficial in a rotation due to large taproots
- A broadleaf crop that can help break up cycles of grassy weeds
- Produces large amounts of plant biomass

The Canolas are oilseed crops. Canola makes up about 23% of the world's vegetable oil production. It is used in the production of numerous cooked and baked products, including puddings and pie fillings, for frying, and in salad dressings.

There are also industrial uses, or potential industrial uses, such as bio-fuel, lubricants, surfactants, printing inks, hydraulic fluids, transmission fluid, and production of biodegradable plastics.



Canola

Yellow mustard is used to produce condiment mustard domestically. Oriental and brown mustards may have economic potential in niche market situations.

Both winter and spring types of Canola exist. The winter types can be planted on summer fallow or on recropped ground. The spring types also can be planted on recropped fields. Yellow mustard produces higher amounts of crop residue than peas and lentils in a rotation. Canola and mustard use more water than do peas and lentils.

The advantages of planting recropped winter Canola include annual cropping and a later planting date, which allows for weed control before planting. Seeding methods include conventional, minimum, and direct seed. In tests conducted by University of Idaho plant breeder and geneticist Jack Brown, winter Canola planted into summer fallow produced higher yields than Canola on recropped ground, but Canola on recropped ground produced yields higher than spring Canola.

In research trials, generally, yellow mustard will outyield spring Canola when grown under similar conditions. When wheat follows yellow mustard in a rotation, wheat yields are higher than when wheat follows wheat, or when wheat follows Canola.

INSECT MANAGEMENT

Gaucha seed treatment and methyl parathion are available for insect control on Canola. Insect pests of Canola in Canada are flea beetles, diamondback moths, and aphids. Cabbage seedpod weevils also can be a problem. Populations of flea beetles can increase rapidly and can be a major problem early in spring Canola immediately following emergence and on winter Canola planted early in the summer. The diamondback moth is a late season insect on spring Canola. It has been found on winter Canola, but not very often. The cabbage seedpod weevil is primarily a problem in bloom. It lays its eggs in the pod, where the larvae feed on the seeds. This weevil has the ability to develop damaging populations rapidly. Aphids are primarily a problem only in spring Canola because winter Canola is well matured by the time aphids hit in the summer. Yellow mustard is less susceptible to insects than is Canola. Jack Brown has reported trials in which yellow mustard produced desirable yields even when no insecticides were applied, and usually outyielded spring species that had received multiple insecticide applications.



Mustard

DISEASES

In Canada, seedling blight, black leg, and Sclerotinia white rot can be problems. Seedling blight has not become a problem in the U.S. Pacific Northwest to date. This disease is primarily transmitted through the seed and causes problems in spring no-till. Growers should be careful when acquiring seed from Canada. Sclerotinia white rot is most commonly a problem in winter Canola in years that have wetter springs.

DEVELOPING YELLOW MUSTARD

Yellow mustard oil characteristics can be altered through plant breeding to produce oil having Canola quality. This is one of the objectives of work by Brown. He also has developed mustard varieties that can be used in place of expensive chemical soil fumigants required for some crops. Because of the cost of fumigants, this fumigant mustard may be viable as a seed crop in this region. When growing yellow mustard do not allow volunteer rapeseed to mature in the crop. If this occurs, it will ruin the entire mustard crop.

OTHER CONSIDERATIONS

A grower must have a complete history of the chemical applications on a field before planting either Brassicas or yellow mustard. For example, if the chemical Pursuit has been used on a cereal crop, wait at least 40 months before planting Brassicas and yellow mustard. Presently, one Canola variety resistant to Pursuit can be planted immediately following cereals treated with Pursuit Clearfield Technology. No yellow mustard varieties are resistant to Pursuit.

GROWING CANOLA

Don Wysocki, Oregon State University Extension soil scientist at Pendleton, says 90% of the challenge of producing winter Canola in the Pacific Northwest is getting a viable stand. Different scenarios in which a grower might be planting winter Canola include early planting into summer fallow and planting late to recrop in an annual cropping system. A third scenario is planting spring Canola in an annual cropping system.

Factors to consider when seeding Canola include rate, row spacing, depth, and seedbed condition. When planting into summer fallow, a grower is dealing with dust mulch.

Canola should be planted at a uniform depth of $1/2$ to 1 inch deep. Place it no deeper than necessary to put it into good, moist soil. Cover the seed only enough to keep the seedbed from drying out. A firm seedbed is essential. This makes Canola a very good crop for a direct-seed system, since such a system places the seed in undisturbed soil. It is essential that the seed is in firm contact with the soil, and that soil moisture is adequate. Soil moisture content of 11% is marginal for seed germination.

Under optimum conditions, a seeding rate of 5 to 7 pounds per acre is advised. Increase this rate to 10 to 15 pounds per acre if planting Canola late, if the seedbed is in less than optimum condition, or if seed placement is less than ideal. Seed placement and uniformity are more critical with small-seeded crops than with cereal crops.

With winter Canola, seeding later produces lower yields. Planting as early as possible is advised. Wysocki notes that late-seeded winter Canola usually outyields spring Canola. The impact of planting late in the fall can be partially offset by increasing the seeding rate.

If a grower does not have a viable stand of winter Canola within 10 days after planting, he or she will not have one, Wysocki says. A stand with one plant per square foot is marginal. Nothing can be done to improve a thin stand, but the plants will compensate to some extent and produce more seeds per plant. However, late planting after a rain will produce a better stand than will planting early and dusting the seed into a dry seedbed.

Another reason to increase the seeding rate for winter Canola might be to counteract the impact of wildlife grazing on the emerged stand. Wysocki notes deer and elk can do a great deal of damage to a crop.

Wysocki advises planting winter Canola in the fall in favorable weather. Do not plant Canola if you expect hot weather. An atmospheric temperature of 90°F will result in a temperature at the soil surface of 120°F, which will create heat stress in emerging Canola seedlings.

An optimum plant population for winter Canola is four and four-tenths plants per square foot. A seeding rate of 7.5 pounds per acre will produce a stand with four to five plants per square foot.

With spring Canola, six to seven plants per square foot is an optimum stand, four to five plants per square foot is adequate, and one to two

is marginal. Seeding rate trials conducted by Aaron Esser, WSU Cooperative Extension educator, determined no significant yield differences in seeding rates ranging from 8 to 12 pounds per acre. What did have an impact was seeding date. Up to a point, delaying seeding of spring Canola will result in increased stand establishment and a higher plant population that is more competitive. Planting earlier produces higher yields.

If frost is a concern when seeding early, the *B. rapa* or Polish strains of spring Canola are more frost tolerant than the *B. napus* or Argentine types.

The cost of Canola seed is about \$2 per pound. On average, there are about 100,000 Canola seeds per pound. The count can range from 90,000 to 120,000 seeds per pound.

As noted earlier, Canola has a large taproot that penetrates the soil as deep as 5 feet to extract moisture and nutrients. Penetration will be less if hard layers exist in the soil profile. The taproot may go sideways, following the path of least resistance instead of penetrating the hard layer. Because of this, Wysocki says there is no substitute for good soil management practices. The taproot will cause some fracturing of hard layers it penetrates, which will aid moisture infiltration in future crops. A winter Canola crop uses about the same amount of moisture as a crop of winter wheat.

CANOLA FERTILITY

A Canola crop requires 6 to 8 pounds of nitrogen for each 100 pounds of seed yield. The timing of fertilizer application is important. Apply starter fertilizer with the seed, especially when planting spring Canola. This may be placed in a deep band between the seed rows. Wysocki advises growers to expect to topdress the winter Canola crop at about the same time they apply an insecticide if needed. Available N in the soil must be adequate at the bolting stage of the plant. As for other nutrients, a nitrogen to sulfur ratio of 6:1 is recommended. A sulfur deficiency will appear as a yellowing of the leaves. Apply phosphorus according to experience and field history.

HARVESTING CANOLA

Canola is usually cut in swaths and allowed to cure in the swath before being picked up and combined. Cutting in swaths when a third of the seedpods are brown is the recommended timing. Trials

have evaluated different times for cutting in swaths, as well as combining direct, and using a polymer spray on the crop to reduce seed shatter and loss. Cutting too early will lower yield by as much as 20%, because fewer of the seedpods will be mature. Wysocki notes when the crop is cut in swaths at the proper time, most of the seed loss occurring at harvest will be due to improper adjustment of the combine.

GROWING MUSTARD

The mustards are broadleaf cool-season spring annuals characterized by a large taproot. They originated in the Mediterranean region and have been cultivated for about 4,000 years. In the Middle Ages, they were grown for their oil, for use as a spice, and for medicine in Europe. They also may be grown as forage, green manure, and garden crops.

Mustard is usually grown under contract. The market for mustard seed is very tight and very competitive. Market volume of the crop is relatively small.

Wysocki says yellow mustard is a good crop for the Pacific Northwest. It works well in rotations for the same reasons Canola does.

SEEDING MUSTARD

The seeding rate for yellow mustard is 7 to 10 pounds per acre. Seeding may be done when the seedbed temperature is above 40°F. The earliest this is likely to occur is between March 20 and April 1. The date may be later in the more northerly regions of Washington.

Place the seed $\frac{3}{4}$ to 1 inch deep in moist, firm soil. A row spacing of 6 to 7 inches is preferred, and 12-inch row spacing is the maximum advised. Rows spaced wider than 12 inches will not suppress weed growth and will allow greater loss of soil moisture due to evaporation.

MUSTARD FERTILITY

The requirements of mustard for nitrogen, phosphorus, and sulfur are similar to those of spring wheat. Soil testing is essential to determine proper rates. The entire soil profile should be tested. The optimum fertilizer placement is with or below the seed.

Growers should pay attention to the amount and source of nutrients. Mustard can be sensitive to a boron deficiency. If boron is included in the fertilizer application, it cannot be placed with the seed without damaging it.

An application rate for nitrogen is 6.5 pounds per 100 pounds of expected seed yield. Soil moisture content will be the determining factor for mustard yield. If the soil profile has 12 inches of available moisture at planting time, the expected yield will be about 1,000 pounds per acre under optimum conditions. If 15 inches of available moisture is present, the anticipated yield will be 1,500 pounds. Over applying N fertilizer to a mustard crop can result in lodging of the crop.

Based on his research, Esser recommends applying 25% more N to winter rapeseed/Canola than is applied to cereals. His recommendation is 25 pounds per acre of sulfur. Little published data exists for phosphorus, potassium, and boron. For winter rapeseed/Canola fertilization, apply boron at a rate of 1 to 2 pounds per acre if the soil test boron is less than $1/2$ ppm.

Wysocki says growers should apply N based on soil moisture. Mustard is an input-specific crop and will react to nutrient shortages. The recommendation for phosphate is 10 pounds available per acre. At least 10 pounds of sulfur is required.

Brian Van Pelt, McKay Seed Company, said his company has been looking at the agronomics of yellow mustard and at applying part of the N requirement in the fall. They are finding that the residual N is almost all in the top foot of the soil profile at planting time, especially in the low rainfall areas. This means the mustard plant taproot will grow past the part of the profile with available N and leave the plant deficient, although the N is available according to the soil test. Applying the bulk of the N in the fall will give it a chance to work deeper into the soil profile where it will be more available to the plant during its later growth stages. The fall application would be supplemented with starter fertilizer at seeding time.

INSECT CONTROL

Potentially damaging pests of mustard include flea beetles, diamond-back moth, and aphids. Wysocki says insects are a lesser problem in mustard than in Canola. He has not seen economically serious levels of insects or diseases.

HARVESTING

Mustard can be direct combined following wheat. Shatter is not the problem with mustard that it is with Canola. Wysocki recommends slowing the cylinder speed to prevent cracking the seed. In addition, the combine speed will be slower than for wheat because a greater amount of biomass is being processed. Store mustard in a moisture content of 10% or less to prevent heating in the bin. Following harvest, growers will have to work out crop handling conditions with the contractor.

OTHER CONSIDERATIONS

Aaron Esser reports that yellow mustard produces more crop biomass than Canola or rapeseed. Consequently, it is more competitive with weeds such as cheatgrass. He found that while the numbers of cheatgrass plants were the same, growth and development of the cheatgrass was suppressed by planting a crop.

Wild oats can have a significant impact on both mustard and Canola crops. Also, catchweed, or bedstraw can be a problem in mustard and Canola because the seed is similar in size and can greatly impact the quality of the end product.

Esser reports that mustard and Canola, when planted using direct-seed methods will produce yields slightly lower than when planted using conventional methods. The mustard appears to be slightly more forgiving than the Canola. For both crops, increasing the seeding rate can offset the slight decreases in yield.

MARKETING MUSTARD AND CANOLA

Brian Van Pelt says the primary factors affecting Canola markets are production, crop timing, and quality. He notes the Pacific Northwest winter Canola crop is harvested ahead of other Canola producing regions. Canada produces on 10 to 12 million acres.

He says there was a carryover of 2.5 million metric tons of Canola in 1999, and the carryover will be 45.7 million metric tons in 2000. Consequently, prices are depressed and have been dropping since 1997. The Japanese market has seen little improvement. Other factors affecting Canola marketing are the exchange rate and the strong U.S. dollar.

Yellow mustard is a contracted crop. Prices are based on Canadian production, which accounts for 90% of the world export market. Stocks have been building and prices dropping as a result. The United States is Canada's biggest customer.

GROWER PERSPECTIVES

Ron Jirava, Ritzville—Mustard and Canola

Ron Jirava has five years of experience with mustard and Canola, using both conventional and no-till methods. He has used no-till for the past 2 years. In his view, the mustards appear to be somewhat more cold tolerant than the Canola.

The first year he used spring no-till he had trouble establishing a stand. He attributes this to seeding too shallowly, which allowed the seed to dry out. Last year, he achieved a good stand, but it froze out. Consequently, he re-seeded the first of May. The crop yielded 350 pounds per acre. Canola seeded using conventional methods with a Valmar® drill produced 900 pounds per acre. For fertilizer, Jirava applies N to 120 lbs. available. He also applies 10 to 15 pounds of sulfur. He has not applied boron.

He aims for a seed depth of $3/4$ to 1 inch. That first year he used no-till for the Canola, the seeding depth was $1/2$ inch and the seedbed dried out down to the depth of the seed. Jirava says the Valmar drill will produce good seed-to-soil contact if the crop is packed following seeding.

Jirava says markets have been very erratic. There is talk of establishing an oilseed crushing facility somewhere in the Pacific Northwest. The impetus for this is the fact that eastern Washington could produce 20% of the oil used for potato processing in the Columbia Basin.

As for Russian thistle, he said the key to control in mustard or Canola is not letting them go to seed in the preceding grain crop. His advice is to use tillage, undercutting, or whatever is needed, to keep thistles from going to seed.

Jirava grew Roundup-Ready Canola in the spring with some success. However, he said that even Roundup will not solve the Russian thistle problem. "Roundup is not effective unless applied when the Russian thistle is in a very early growth stage, and then the application will be too early to control other weeds."

Jirava obtains slightly higher wheat yields when wheat follows Canola or mustard in his rotation.

Chris Laney, Sprague—Canola

Chris Laney has been growing Canola for 15 years. He notes that a year of Canola in a rotation will not solve *Rhizoctonia* root rot problems in following cereal crops.

Laney uses the same equipment for Canola as he uses for cereals. He likes the Canola because it lets him control grassy weeds. It allows longer integrated pest management cycles, slowing the development of resistant weeds.

Laney says the input costs for Canola are higher than for cereal grain, and the crop is more difficult to establish. It is also slower to harvest.

When growing Canola, it is vitally important that growers know the field history. The Canola is super sensitive to the sulfyurea-type herbicides such as Glean, Finesse, Ally, and Maverick, and Pursuit, which are not registered on Canola, but are used on peas.

To prevent problems with black leg, a seedborne fungal disease, he uses clean seed treated with Benlate. Gaucho is recommended as a 45-day systemic insecticide seed treatment to prevent damage by aphids and flea beetles. Packing following seeding can improve crop emergence.

Laney has experience with both the *B. napus* and *B. rapa* Canola types. He says the *B. rapa* types have smaller seeds, better frost tolerance and winter hardiness, are earlier maturing, seem to yield better under dryland conditions, but have a slightly lower yield potential. He uses a seeding rate of 4 to 6 pounds per acre for the *B. rapa* varieties.

The *B. napus* types have larger seeds, better disease resistance and are later maturing. They have a higher yield potential than the *B. rapa* types, and lodge less. He seeds the *B. napus* types at 6 to 8 pounds per acre. For weed control, Laney uses Roundup RT and Treflan. He also uses Poast for grassy weeds. For insect control, he uses the Gaucho seed treatment and applies Capture by air if needed. Timing is critical for insect control, he emphasizes.

He cuts the crop in swaths for harvest. According to Laney, the *B. rapa* types have fewer problems with shattering, and the *B. napus* types are getting better. The Spodman polymer sprays are available to counteract shatter problems, he notes, but cutting in swaths

speeds the harvest and helps ensure the uniformity of the crop. The winter types mature earlier than the spring types.

Laney harvests when the crop is at 8% moisture. He notes Canola dries down faster than grain. Yields vary more than do those of cereal grains. Spring Canola yields will be 60% to 80% of spring wheat yields in pounds, and 50% to 70% of spring barley yield in tons. Dockage factors include trash, percentage of green seeds, and oil content.

Laney said the crop residue from Canola is very fragile and is easily destroyed. It tends to be very brittle. He says volunteer Canola will winterkill, or it can be controlled with 2,4-D.

Roundup-Ready varieties of Canola are available. Laney says a grower needs to choose an appropriate variety for the conditions. He also notes Japan may be a market for non-GMO Canola, so it is essential to keep the Roundup-Ready Canola separate from conventional varieties.

Among brands, Laney says the Hyola varieties from Interstate-Payco Seed appear to be significantly higher yielding than other varieties. He emphasizes Canola is a riskier crop to produce than wheat or barley.

Hal Johnson, Reardan—Canola

Hal Johnson grows spring Canola on recrop ground and has grown winter Canola. He uses a seeding rate of 4 to 5 pounds per acre. He feels he cannot justify a higher rate from an economic standpoint. He has lost crops to frost and admits this can be a problem in the more northerly growing areas of Washington State.

He finds the Canolas now available are too tall. He would like to see Canolas having less vegetative growth and more seed production. He feels varieties are not well adapted to areas such as northern Lincoln County. He has had no problems with diseases.

Johnson notes crop residue from a good Canola crop can present a management problem. He uses a chaff spreader and still has had to go in with a harrow to spread it out to penetrate the residue with a John Deere 750 no-till drill.

Johnson says he has not used any of the sulfyurea herbicides on cereals preceding Canola, except for Harmony, for several years so he has not had any problems with long residuals. Nothing is available to control broadleaf weeds such as wild buckwheat or gromwell. Although he has tried Treflan, he feels it may damage the cereal crop following the Canola so he does not use it any more.

He is using the Canola crop to clean up his wild oat problem with Poast and Assure II. He says he used to be cheap and not spray the whole field, but now he sprays the entire field. Johnson explains just enough oats are out there to keep the weed populations coming. The Canola also provides an opportunity to help clean up cheatgrass.

Isolation is one practice growers should consider, according to Johnson. Where the crop is placed and what is growing beside it is important. Canola may be sensitive to broadleaf herbicides used on wheat or barley. He says he has sprayed right up next to a Canola crop using a ground sprayer without doing any damage.

A good, uniform seedbed is essential for crop establishment. Johnson puts the seed $\frac{1}{2}$ to 1 inch deep. He says in some dry springs, it might be best for growers to consider another crop. He has had situations where it was necessary to use a seeding depth of as much as $1\frac{1}{2}$ inches to put the seed into good moisture.

Johnson says if you have a dry winter, you had better think hard about planting Canola. If you have a dry year, it probably is not a good idea. If the moisture is not in the soil profile, it probably is not worth the risk. He feels using direct-seed production methods helps conserve moisture.

There are variety differences in maturity. Johnson says he has planted Hyola varieties that were 2 weeks earlier than other varieties and the yield was around 1,500 pounds compared with 1,000 pounds for the later varieties. Early vigor and stand establishment can make a real difference, he points out.

He says closer row spacing is better because it allows better weed control. Johnson says growers should check seed placement and rate for the first one or two rounds to ensure they are getting the desired results. Otherwise, the grower can waste money on expensive seed.

Johnson says they watch their fields carefully. If they see weeds coming, they spray after seeding but before the crop emerges. This approach can provide better weed control than just spraying Roundup prior to seeding, and then postseeding if needed. They also use Poast and Assure II to control wild oats later in the crop.

Johnson applies a liquid starter fertilizer that includes nitrogen, phosphorus, and sulfur with the seed. He uses 16-20-0 fertilizer. He tried boron one year but did not see any response. He prefers Capture to methyl parathion to control aphids.

He cuts the crop in swaths for harvest. He feels this puts the crop in a safer position and he can delay combining a little without having the crop get hurt. He would like to eliminate the cost of cutting in swaths, which he says is \$11.50 per acre, but he does not feel it is possible with current varieties. Cutting in swaths lays the crop on top of the stubble, where he is able to pick it up with his regular header and pickup reel. He has harvested direct-cut with the Hyola variety he tried and likes that too.

As for combine settings, he says reel height is not as important in a crop cut in swaths because the Canola tends to tie together, and it is not a problem getting it into the combine. As for concaves and cylinder speed, he says to slow the cylinder down to 350 to 400 rpm and make sure the concaves are open, but leave room to open them up if necessary to get a slug through. He sets the sieves tight, and uses a ground speed 1 to 2 mph to avoid overloading the machine. "In a heavy Canola crop, because you are cutting the straw below the swath and picking up the whole thing, you are moving a lot of material through the combine."

Johnson says it is difficult to make Canola pay as a crop. He says it does not pencil out. You get about the same amount of money as you do from barley in his area, while the expenses are considerably higher. The seed cost is considerably higher, fertility is about the same, weed control is approximately the same, and insect control can be as much as \$16 to \$18 per acre, and cutting in swaths is \$11.50 per acre. The numbers make it difficult to justify the crop economically on a one-third, two-thirds crop rent with the property owner. It does have value as a rotational crop.

Johnson thinks mustard is better than Canola as a rotational crop, however. It also is better for suppressing weeds. Insect control costs are lower. It can also be direct-combined.

Spring Canola Varieties and Sources

Westar
Profit
Goldrush
Hero
Cavallier—Cargill Hybrid Seed
Roseau—Cargill Hybrid Seed
CL. 2070—Croplan Genetics and Cenex/Land O' Lakes
IMC. 105—InterMountain Canola/Cargill
IMC. 108—InterMountain Canola/Cargill
IMC. 106-RR—InterMountain Canola/Cargill
IMC. 107-RR—InterMountain Canola/Cargill
IMC. 203-RR—InterMountain Canola/Cargill
Advantage—IntegraSeed LTD
Battleford—IntegraSeed LTD
Crackerjack—IntegraSeed LTD
Eagle—IntegraSeed LTD
Int. 701—IntegraSeed LTD
Raid-RR—IntegraSeed LTD
Hyola 308—Interstate-Payco Seed
Hyola 401—Interstate-Payco Seed
Hyola 420—Interstate-Payco Seed
Hyola 375-RR—Interstate-Payco Seed
Quest-RR—Interstate-Payco Seed
Sunrise—University of Idaho
Premier—University of Idaho
Sterling—University of Idaho
Garnet—University of Idaho

All above varieties are B. napus types except Goldrush, which is a B. rapa type. All are Canola-quality except Hero, Sterling, and Garnet, which are industrial quality. Varieties ending in RR are tolerant to Roundup.

Winter Canola Varieties and Sources

CEB.9607—Cebeco-Zaden B.V.
 Contract—InterMountain Canola/Cargill
 DCH.29—InterMountain Canola/Cargill
 Ceres—IntegraSeed LTD
 Hansen—IntegraSeed LTD
 Olsen—IntegraSeed LTD
 Wichita—Kansas State University
 Ericka—McKay Seed
 Inca—Spectrum Crop Dev.
 Rapier—Spectrum Crop Dev.
 Salute—Spectrum Crop Dev.
 Selkirk—University of Idaho

All above varieties are B. napus types except Salute, which is a B. rapa type. All are Canola-quality.

Mustard Varieties

Yellow Mustard
 IdaGold—University of Idaho
 AC Pennant
 Tilney
 Gisilba
 Oriental Mustard
 Pacific Gold—University of Idaho
 Cutlass
 Leth.22A
 Blaze
 Brown Mustard
 Kodiak—University of Idaho
 Common Brown

AC Pennant, Tilney, and Gisilba were developed in Canada or the United Kingdom. Cutlass, Lethbridge 22A, Common Brown, and Blaze were developed in Canada.

This publication was supported by Grant 12W-4146-2029, OGRD #90494/01048, USU, Subcontract #99-057.

Co-sponsored by Western Region Sustainable Agriculture Research and Education (SARE), and Washington State University Center for Sustaining Agriculture and Natural Resources. Series Editor: Edward B. Adams, Agriculture and Natural Resources Program Leader.

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College of Agriculture and Home Economics

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