

Cabbage Seed

Brassica oleracea (Cruciferae)

Fast Facts:

Acres in Washington:	open pollinated: 600 acres average	hybrid: 600 acres average
Average Acre Value:	open pollinated: \$400	hybrid: \$2,000-\$2,500
Value of Production in Washington:	open-pollinated: \$400-\$500,000	hybrid: \$1.2 million average
Percentage of Production:	75% of U.S and 50% of world production	

Description of crop:

This biennial crop is planted from mid-August to mid-September and harvested the next year from July to September. Cabbage seed is sown initially in greenhouses. In August, or September the seedlings are transplanted into fields. The crop is hand-hoed to remove weeds and rogued to remove plants not displaying true varietal characteristics. At harvest, the crop is cut, windrowed and dried in the field for 10 to 14 days. After drying, the crop is threshed and the seed is sent to a conditioning plant, where it is cleaned to 99% purity. Five to ten acres is the average field size for hybrid seed and 15 acres is the average for open-pollinated crops. The rotation period for cabbage seed is a minimum of five years to reduce problems with pathogen inoculum build up in the soil. Cross-pollination is addressed by controlling isolation distances.

Cabbage seed crops are insect pollinated. Pollination by insects greatly affects the chemicals that can be used on this crop.

Seed production in the U.S. occurs principally in the Skagit Valley. This area has a mild climate, favorable soils and an abundance of syrphid flies and bees which are excellent pollinators.

Key pests:

Severe insect pests include cabbage aphid, turnip aphid, seedpod weevil and cabbage maggot. Other insect pests include cabbage looper, springtails, webworms, diamondback moth, cutworms, symphylans and wireworms. Weed pests include shepherdspurse, mustards, lambsquarter, pigweeds, smartweed, henbit, groundsel, chickweed, wild turnip, oat, Canada thistle, bolt thistle, vetch, nightshades and bed straw. Shepherdspurse, groundsel and henbit are the more problematic weeds. Weeds are serious pests because seeds that the weeds produce are often very difficult to sort out of the seed crop. If the contaminating seeds are too costly or impossible to sort out, the seed crop is considerably lowered in value or rendered unmarketable. Weeds also serve as a host for insects and diseases. The most serious diseases are powdery mildew, downy mildew, black rot, black leg, Alternaria black spot and white mold. Bacterial soft rot of the heads and gray mold can occur in spring following winter injury. Club root can be an occasional

problem. Ring spot occurs every winter/spring but is seldom of economic significance. Black rot and black leg are of quarantine significance and largely managed by strict screening of stock seed lots so that only non-infected stock seed is planted.

Key pesticides:

Lorsban and diazinon are used for insect control, and endosulfan is applied mid-bloom to Seedpod weevil, cabbage maggot, cutworms and loopers. *Bacillus thuringiensis* is also used in the control of seedpod weevil, loopers and cutworms. Treflan is used as a pre-plant incorporated herbicide to control broadleaf weeds, and Fusilade is applied occasionally after harvest to control grasses. Poast controls grass weeds. Cultural practices such as extending the rotation period to 3 to 5 years helps reduce inoculum levels of pathogen in the soil particularly to manage *Alternaria* black spot, white mold, club root and other disease. Stock seed is treated with mefenoxam, thiram and sometimes fludioxonil to control seedling blights. The loss of benomyl as a seed treatment in 2006 created significant concern about black leg becoming established in the seed production area again as benomyl seed treatment largely eradicated the problem from the cabbage seed industry. Thiabendazole has proved an effective alternative so an emergency seed treatment registration for stock seed lots was approved. Iprodione is applied to control *Alternaria* black spot and white mold. Boscalid and cyprodinil + fludioxonil are also used for white mold and gray mold (for the latter, in spring following any winter injury, for the former, starting at early petal fall). Mefenoxam, metalaxyl and cymoxanil control downy mildew. Azoxystrobin and pyraclostrobin are used to control powdery mildews, *Alternaria* black spot and white mold. Mancozeb and chlorothalonil are used for general disease control. Due to overwintering damage, copper hydroxide is usually applied in late winter or early spring to control bacterial soft rots. Copper hydroxide is applied to control bacterial soft rots and mancozeb to help prevent black rot. Black-rot infected crops or seed lots are destroyed to prevent spread of the disease. The black rot bacterium can be spread by water, insects, equipment and animals. It persists in infected plant debris for up to two years and in the soil for months. Club root is largely controlled by applying limestone prior to planting to raise soil pH.

Critical pest control issues:

The loss of dimethoate use was significant. Mitigation to comply with urbanization, salmon and water buffer issues are expensive. It is critical that growers maintain efficacious and economical herbicides. The profit margin is quite narrow on small seeded vegetable seed crops. If the margin is reduced by higher weed control costs, higher sorting costs or lower value due to weed seed contamination the result could be economic loss to the grower. Increasing urbanization and hobby farmers are an ongoing problem (the latter because of pollen isolation issues for this insect-pollinated crop). Isolation distances are required of up to 2 miles or more. It is increasingly difficult to achieve this to prevent unwanted cross-pollination between different parent lines or different members of the same species. The loss of benomyl as a seed treatment in 2006 created significant concern about black leg becoming established in the seed

production area again as benomyl seed treatment largely eradicated the problem from the cabbage seed industry. Finding more effective alternatives than copper hydroxide for control of black rot is a high priority need for cabbage seed production.

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Location

of production: Production is limited to the west side of the state. This is due to the fact that the more temperate climate of the west side is ideal for over-wintering plants for vernalization (bolting). The milder summer temperatures allow for uniform bolting. The more extreme heat of the east side of the state shortens the open bloom time and decreases the germination of the harvested seed. The main areas are Skagit, Snohomish, Island and Clallam Counties.