varies according to species, variety, growing conditions, and pollination efficiency. In cabbage, the typical seed yield is 12 to 20 seeds per pod. A large, well grown, efficiently pollinated cabbage will yield up to one half-pound of seed per plant. This figure should not be used for planning purposes because pollination and growing conditions are rarely optimum. When estimating yield under normal conditions with average pollination and seed set, a more conservative yield of one-quarter pound of seed per plant is a more realistic estimate. The average number of seeds per ounce for cabbage, cauliflower, collard, kale, kohlrabi, Brussels sprouts, Chinese cabbage, and collard ranges between 7,000 and 9,000. Mustard and turnip average 15,000 seeds per ounce, and radish 2,500 seeds per ounce.

Seed germination:

The statistics on seed germination in relation to temperature are given in the table below:

Type of crop	Minimum (ºF)	Optimum Range (ºF)	Optimum (ºF)	Maximum (ºF)
Cabbage	40	45 to 95	85	100
Cauliflower	40	45 to 85	80	100
Radish	40	45 to 90	85	95
Turnip	40	60 to 105	85	105

Note: The optimum temperature for germination is higher than the optimum temperature for crop growth. These data on soil-temperature conditions for vegetable seed germination were compiled by J.F. Harrington, Dept. of Vegetable Crops, University of California, Davis.

ISOLATION DISTANCES

Complexities within the brassicas that affect isolation distance determinations

Determination of minimum isolation distances in the production of cole crops is complicated by the fact that not only will members of the same type of crop cross with each other, but also two different crops (such as cabbage and cauliflower) will cross with each other if they belong to different subspecies or horticultural groups (in this example, *Brassica oleracea captata* x *Brassica oleracea botrytis*). An additional layer of confusion arises with *Brassica rapa* due to the fact that some members of the *B. rapa* subspecies may have more than one common name. These issues make seed production in cole crops much more complicated than other seed crops. Pollinators of the cultivated brassicas do not make botanical distinctions between the types of flowers they visit. Therefore, for determining isolation distances, it is essential that the seed grower make the necessary botanical distinctions, because the pollinators will not.

Adding to this complexity is the fact that certain cole crops (for example, *Brassica rapa*) are still in taxonomic flux due to differing interpretations by taxonomists. The Chinese (Asiatic) cabbages and mustards are illustrative of this point. For example, most taxonomists place Chinese cabbages and mustards into one of three groups:

- Pekinensis Group (Chinese cabbage, celery cabbage, and pe-tsai)
- Chinensis Group (non-heading Chinese mustard, celery mustard, and pak-choi)
- Perviridis Group (spinanch mustard)

The uncertain taxonomic relationships of *Brassica rapa* remain to be sorted out by molecular geneticists. For the seed grower, regardless of the taxonomic classification of the subspecies, it is important to know that all of these will cross with each other (and with turnip and broccoli raab) because all these subspecies belong to *Brassica rapa*.

Another confusing group is kale. By reference to the botanical classification table on page 3, it can be noted that kale (*Brassica oleacea)* will cross with other members of the same species, such as cabbage, broccoli, cauliflower, collards, kohlrabi, and Brussels sprouts. However, several kales (for example, Hanover Salad and Siberian Kale) are *Brassica napus* which will cross with rutabaga, but not sea kale (*Crambe maritime*) or Chinese kale (*Brassica oleracea*).

Other factors to consider in determining isolation distances are environmental conditions, planting time, and earliness to flower. Previously it was mentioned that short-season broccolis planted in early spring might flower and produce seed by late summer. Also Chinese cabbage and