# Kinetin improves lettuce germination

Norman C. Welch

Freshly harvested lettuce seeds often fail to germinate under favorable temperature and moisture conditions—a failure called post-harvest or after-ripening dormancy. In most varieties, such dormancy decreases during storage; storage time needed depends on variety, percentage of moisture in seeds, field temperature at seed maturation, and possibly other factors. Post-harvest dormancy can be largely overcome by pre-chilling moist seeds for five days at 12° C.

Lettuce seed produced in the San Joaquin Valley is harvested at about the time of the first plantings in the Imperial Valley. Seed produced in Mexico is harvested during late spring and early summer and could be planted immediately in central coastal valleys if it were not for the dormancy problem. Seed is not immediately available for planting, because seed given a moist pre-chilling treatment for five days and then dried does not perform properly in the field.

Kinetin (6-furfurylamino purine) and gibberellic acid ($GA_3$) were tested in a search for a method of breaking post-harvest dormancy more quickly. Freshly harvested seeds of four cultivars of lettuce (*Lactuca sativa*) were used; seeds for all treatments on each particular cultivar were harvested on one date. At the beginning of these experiments, more than 90 percent of the seeds of each cultivar germinated at 15° C, and less than 2 percent germinated at 30° C. However, the germination percentage varied at the intermediate temperature of 25° C, as follows: Calmar, 0 percent; Big Boston, 1 percent; Dark Green Boston, 2 percent; and White Boston, 7 percent.

Seeds were germinated on moistened filter paper in covered glass petri dishes. Each treatment contained six dishes of 50 seeds each.

In the gibberellic acid treatments, either in combination with the kinetin treatment or alone, the filter paper was moistened with 6 ml of 100 ppm aqueous solution of the chemical; controls were moistened with 6 ml distilled water.

Kinetin dip treatments were made by counting seeds into small bags, which were placed for five minutes in small vials containing 100 ppm kinetin; controls were dipped in distilled water only. The seeds were then placed on moistened filter paper in the dishes.

The dishes were held in the dark in incubators controlled at 15°, 25°, and 30° C, except when seeds were being treated or when germination counts were made at 24-hour intervals after treatment. Germination was defined as the first visible protrusion of radicle through the seed coat.

Germination percentages are averages of six replications. Each experiment was made twice, and data for both were combined, because results were almost identical.

Seeds of all cultivars held at 15° C germinated at about the same rate regardless of treatment.

At 25° C, post-harvest inhibition of the Calmar variety decreased and germination percentage increased as time passed after harvest, regardless of treatment. Kinetin significantly hastened germination after each of four treatment dates, as follows: October 6, 94 percent germination in the kinetin treatment, compared with 23 percent for the control, seven days after treatment; October 17, 100 percent germination two days after kinetin treatment, compared with 91 percent in six days for the control; October 21, 100 percent in three days, compared with 96 percent in six days; October 23, 99 percent in two days, compared with 97 percent in four days. (Kinetin treatments were significant at 1 percent from the check.)

PERCENT GERMINATION OF SEEDS OF THREE LETTUCE VARIETIES HELD AT 25° AND AT 30° C

| Variety and treatment* | Percent germination† on: days after treatment | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| At 25° C: | | | | | | | |
| Dark Green Boston | | | | | | | |
| kinetin | 43 | 82 | 90 | 93 | 94 | 94 | 95 |
| check | 2 | 35 | 55 | 57 | 58 | 64 | 64 |
| Big Boston | | | | | | | |
| kinetin | 26 | 55 | 70 | 84 | 86 | 86 | 87 |
| check | 1 | 20 | 32 | 54 | 58 | 58 | 60 |
| White Boston | | | | | | | |
| kinetin | 31 | 77 | 83 | 87 | 89 | 90 | 91 |
| check | 7 | 42 | 63 | 64 | 67 | 70 | 71 |
| At 30° C: | | | | | | | |
| Dark Green Boston | | | | | | | |
| kinetin | 0 | 1 | 1 | 3 | 4 | 4 | 4 |
| check | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Big Boston | | | | | | | |
| kinetin | 0 | 0 | 0 | 1 | 2 | 2 | 2 |
| check | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| White Boston | | | | | | | |
| kinetin | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| check | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

* Kinetin treatment: seeds dipped in 100 ppm kinetin (6-furfurylamino purine) for five minutes. Check: seeds dipped in distilled water only.
† Kinetin treatments significant at 1 percent from check.

At 30° C, germination of kinetin-treated Calmar seed increased over time, as follows: 1, 65, 75, and 79 percent, respectively, in four tests. Untreated seed failed to germinate.

At 25° C, kinetin-treated seed of three other lettuce varieties germinated faster and more completely than did the controls (see table). As with Calmar seed, the rate and total germination percentage increased with passage of time from harvest. Seeds of three varieties held at 30° C germinated very poorly (see table), although kinetin slightly improved germination for all varieties.

Gibberellic acid treatments did not influence germination either alone or in combination with kinetin in any of the experiments.

## Conclusions

After-ripening dormancy of Calmar variety lettuce seed can be overcome by soaking seeds in 100 ppm kinetin for five minutes. Kinetin treatments significantly improved germination of seeds of all four lettuce varieties at the 25° C storage temperature.

At 30° C, Calmar seeds responded significantly to kinetin treatments in three of four tests, but seeds of White Boston, Dark Green Boston, and Big Boston responded only slightly. The data suggest there may be a relationship between high temperature and after-ripening dormancy, because kinetin affects both conditions.

Gibberellic acid at 100 ppm did not significantly affect germination. James F. Harrington, of the U.C. Department of Vegetable Crops, working in the Imperial Valley and at Davis, also reports that gibberellic acid did not affect germination of lettuce seed with post-harvest dormancy. He did observe an increase in percentage of germination when kinetin was used on desert crisp head lettuce varieties at elevated temperatures.

*Norman C. Welch is Farm Advisor, Santa Cruz County.* *The author thanks O. E. Smith, formerly Professor, University of California, Riverside, for his advice.*