Genetics of string formation in pea pods

McGee, Rebecca J. Pillsbury-Green Giant, LeSueur, MN 56058, USA
Baggett, J.R. Dept. of Hort., Oregon State Univ., Corvallis, OR 97331, USA

Edible pea pods (snow peas and snap peas) as well as parchmented green shell and dry edible peas are characterized by pods which have a prominent string along both sutures. The string, composed of lignified sclerenchymous fibers, is removed from edible pod peas before they are eaten. This string is especially disadvantageous in snap peas which are typically eaten at a more mature stage than snow peas. Two mutations resulting in stringless pods have been reported in the literature. Lamprecht (1) described a spontaneous mutation, which he termed *sin,* that has been lost. Wellensiek (2) recovered a stringless mutant from ethylene imine treated 'Dominant' and noted only that its expression was dependent on high temperature. This mutation has been used in the development of the available stringless cultivars. We studied the inheritance of Wellensiek's stringless pod mutation and investigated its association with pod size, plant vigor, seed type and pollen germination and growth.

In crosses between stringless and stringy pod pea cultivars, all plants of the F_1 and backcross to the stringy parent had stringy pods. F_2 ratios varied widely among crosses and always had an excess of stringy plants over expectations based on a single locus. The ratio of non-segregating (stringy): segregating F_3 families derived from stringy F_2 plants fitted a single gene hypothesis in half the crosses. Back-crosses of F_1 to the stringless parent fitted the expected 1:1 ratio when the pollen parent was stringless, but the reciprocal back-crosses showed a deficiency of stringless plants, suggesting that poor competitive ability of pollen bearing the stringless factor was the reason for deficiencies of numbers of stringless plants.

There was no difference in percent germination, *in vitro,* of pollen from stringless or stringy cultivars. However, pollen tubes from stringless plants grew slower *in vitro* than pollen from stringy plants. Differences in pollen tube growth rates were demonstrated *in vivo* following time-course pollinations involving reciprocal crosses between stringless and stringy peas. Eight hours after pollination, stringless pollen tubes had entered 12.6% of the ovules compared with 51.2% for the stringy pollen. Stringless pollen entered 29% and stringy pollen 66% of the ovules after 10 hours The slower growth rate of stringless pollen is a plausible explanation for the observed deficiencies in numbers of stringless plants in segregating generations.

Based on the nature of the origin of the stringless mutation (chemical mutagenesis), the nature of the recovery of stringless segregates in the back-crosses of F_1 to a stringless male, and the demonstrated differential growth rates of stringless and stringy pollen, we conclude that stringlessness in peas is governed by a single recessive gene for which we are proposing the symbol *sin-2.*

The results of our studies will be reported in detail elsewhere.

---

1. Lamprecht, H. 1938. Der Züchter 10: 150-157.
2. Wellensiek, SJ. 1971. PNL 3: 48.