Improving Seed Yield in Hull-less Seeded Strains of Curcurbita pepo

J. Brent Loy
Department of Plant Science, University of New Hampshire
Durham, NH 03824

Research on hull-less seeded strains of pumpkin was initiated at the NH Agr. Exp. Sta. 10 years ago, and during the past 6 years there has been a major effort to develop snack seed strains or strains bred chiefly for seed yield. The approach to increasing seed yield has been as follows: (1) develop bush strains amenable to high density planting, (2) develop strains which produce small fruit with a minimum of fleshy tissue, and (3) select strains which have high seed yield per fruit. There are numerous other important characters such as seed size, seed fill, seed color, ease of seed removal, flower ratios, fruit maturity, and pollen load which have to be dealt with, but I wish to comment only on progress we have made with respect to the three objectives above.

We have developed two F7 bush lines of pumpkin with hull-less seed and fruit size ranging from 0.5 to 2.0 kg, depending upon the spacing and fruit load per plant. Seed yield of one strain, NH14-40-6, was evaluated in 1985 at different planting densities, and seed yield and several components of seed yield were determined in 1986 with two strains, NH14-40-6 and NH55-7-20. To evaluate components of yield, a spacing trial was conducted using what will be referred to as a gradient density planting scheme. Within a multiple density planting block, subplots of 7 plants each (2 guards) were arranged across rows spaced 0.3 m apart. Different density subplots were then spaced at progressively increasing within row spacing from 0.3 to 1.5 m. This produced plant populations from 7,980 to 35,880 plants/ha.

Maximum yields were low in 1986 due to a poor growing season, but the results, nonetheless, illustrate relationships between plant density and different components of yield (Table 1). Seed yield of NH14-40-6 decreased from 58.7 g per plant at the lowest density to 22.2 g per plant at the highest density. In contrast, total seed yield per hectare was lowest (468 kg/ha) at the lowest plant density and was greatest (795 kg/ha) at the highest plant density. The same relationship between planting density and total yield was observed in 1985, only maximum yields were in excess of 1,400 kg/ha at the highest plant density (23,919 plants/ha). Seed yield per plant decreased at higher plant densities primarily because of fewer fruit per plant, and to a much lesser extent because of smaller fruit and concomittant lower seed yields per fruit. We obtained results similar to those shown above the other inbred strain, NH55-7-20, but seed yield per plant was 15 to 20% higher. There was considerable variability in seed yield among replicates in both years; in future gradient density yield trials, data plants per subplot will be increased from 5 to 10.

The proportion of dry matter partitioned into seeds versus flesh in an especially important component of yield. This component is affected by the number and weight of seeds, the proportion of fleshy tissue, and the percent dry matter of the fruit. I have chosen to describe this component by a seed index (SI) which is the ratio of seed dry weight to total dry weight of the fruit. Both of the strains used in the spacing trials exhibited very low seed indices between 23 to 30% (Table 1). Both strains had low flesh dry matter (mean of 4.6 to 6.1%), but neither strain was particularly seedy and both had

relatively thick flesh. Through appropriate crosses early generation lines have now been produced which have SI's between 40 to 57%. We have observed good correspondence between SI's obtained in F2 selections and those observed in F3 progeny, although there was obvious segregation among some lines for seed fecundity, flesh thickness, and flesh dry matter. Fruits within a plant selection were surprisingly uniform for both percent dry matter and seed yields among bush segregants. Breeding plots of these bush lines are now being seeded at a relatively high density (0.3 m within row, 1.8 m between rows), so that interplant competition approaches that likely to be encountered in commercial production.

Table 1. Effect of plant density on yield components in a hull-less seeded strain (NH14-40-6) of pumpkin.[1]

Yield Components	Plant density (plants/ha)				
	7,973	10,251	14,351	23,919	35,879
Fruit no./plant	3.5	2.7	2.1	2.1	1.5
Fruit wt.(kg)/plant	1.2	1.2	1.0	0.9	0.8
Seeds (g)/fruit	17.1	18.0	21.0	14.4	14.6
Seeds (g)/plant	58.7	48.8	44.4	29.8	22.2
Seed index (SI)[2]	24.7	22.7	28.2	27.1	29.4
Seed wt. (kg/ha)	468	500	637	714	795

[1]Three replications, 5 data plants per subplot spacing.
[2]Seed index (SI) is the ratio of seed dry weight to total fruit dry weight x 100. It is a measure of the efficiency with which dry matter is partitioned into seed within a fruit.