Replicated clonal selection for improving forage yield of alfalfa – Preliminary Report. J. Hansen, J. Crawford, C. Brummer, R. Michaud, A. Claessens, S. Acharya, Y. Papadopoulos, J. Lamb, C. Sheaffer, D. Viands.

Recurrent phenotypic selection has not been very effective for increasing yield potential of alfalfa germplasm adapted to North America. Rumbaugh et al. (1988) mentions replicated clonal line selection as one approach to eliminating escapes. The research objective is to determine if replicated clonal evaluation across multiple environments is effective in improving alfalfa forage yield. One genetically broad alfalfa population was created through cross pollination of three populations and then random mating for two generations. Two hundred plants were randomly chosen to initiate the clonal evaluation (0358-Cycle 0). Rooted stem cuttings from each of these 200 genotypes were sent to four collaborators for Cycle 1 (Table 1). Three replicates of three ramets per replicate of each genotype were established in field nurseries. At the end of the second production year, the highest yielding 10% (20 genotypes) across locations were intercrossed to produce Cycle 1 seed. Cuttings of the Cycle 1 population (200 plants) were sent to three cooperators for a second cycle using the same methods as for the first cycle. The populations developed were: multiple location clonal selection (1222), and clonal selection based on the NY yields (1221-cycle1 multiple environments, cycle 2 NY). The genotype rankings by locations for each cycle of selection were not highly correlated. Thus the selected plants were the best ones over locations, but were not the best ones at each location. In NY, a population was develop by mass selection (1210 cycle 2). Syn. 2 seed of the populations was produced for trials.

Table 1: Data from each location that were compiled for selecting 20 genotypes each cycle.

Location	Cycle 1	Cycle 2
Alberta, Canada	Visual score - 2 Har., 1 Yr.	Visual score -1 Har.; Yield-1 Har., 1 Yr.
Quebec, Canada	Yield - 3 Har., 2 Yr.	Yield - 3 Har., 1 Yr.
Iowa, USA	Yield – 6 Har., 2 Yr.	-
New York, USA	Yield – 6 Har., 2 Yr.	Yield – 6 Har., 2 Yr.

In 2013-14, yield trials were established at 6 locations, three in Canada and three in USA. The trial entries were the three parent populations, Cycle 0 (0358), Cycle 2 across locations (1222), Cycle 2 NY selection (1221), Cycle 2 mass selection (1210). Three trials have been harvested for 2 production years and three trials have been harvested for 1 production year. The total entry yield across years are presented as a percent of mean trial yield. The average yield of the three parent populations over locations (98%) was lower than the Cycle 0 yield (102%), thus the Cycle 0 population had hybrid vigor for yield. The Cycle 2 NY selection (1221) yielded more than the Cycle 0 (0358) at three out of six locations, and more than the parent population average at five locations. The Cycle 2 across locations (1222) yielded more than the Cycle 0 and the parent average at one and three locations, respectively. The Cycle 2 mass selection (1210) yielded less than the Cycle 0 and yielded more than the parent average at two locations. Preliminary results indicate that clonal selection over diverse locations was less effective than maximizing heterosis. Clonal selection at one location for the second cycle resulted in a population that yielded more than the initial populations. Yield trials that are evaluating these populations are ongoing at four of the six locations.