The Effect of Inbreeding on Crimson Clover Seed-Coat Permeability

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Crimson clover has been considered an exception among the small legumes regarding the small percentage of hard seed produced by the species. Kephart (4) states that crimson clover produces little or no hard seeds, often germinating 90% in 2 days.

To insure against a total loss from early germination under conditions of a limited moisture supply, seeding in the hull has been commonly advocated. Stitt (8) found that unhulled seed absorbed water much more slowly than hulled seed.

Lute (5) classified alfalfa into three groups based upon the percentage of hard seed produced by the progeny of alfalfa plants differing in permeability. Harrington (1) decided that seed coat permeability was not a varietal characteristic of red clover. Pieters (6) was unable to find any evidence of inheritance of seed permeability in *Lespedeza sericea*. On the other hand, Stevenson (7) concluded that hard-seeded parents of white sweet clover produced more hard seeds in the progeny than softer-seeded parents.

The need for a hard-seeded strain of crimson clover led to the initiation of the work reported herein. Since its inception, however, locally adapted strains with the ability to volunteer have been widely accepted as being hard-seeded.

Methods and Materials

Six hundred selfs were made in the spring of 1944 among plants from three seed sources: volunteer plants growing around the Agronomy farm at Athens, Georgia, plants from seed of European origin seeded in 1938, which was combine-harvested through 1943 for reseeding, and plants of a local strain known as Allen's.

Selfs were made by placing onion-skin envelopes over individual heads. The envelopes were made using waterproof cement and the closed corners clipped slightly to provide for aeration. The bottoms of the envelopes were folded around the plant stems and fastened with paper clips. The envelopes were removed periodically in order to roll the heads to assist tripping. At harvest time the selfed heads were kept separated from the open-pollinated heads and saved for parent seed. Seed from 303 plants was recovered at harvest time. If the normal 5 to 10% of hard seed in the average crop were from hard-seeded plants, this number should have provided 15 to 30 parents which could be considered hard-seeded.

To save time, the seed of the first two generations was hulled with a machine designed and built by the writer (3). The seed crop of 1946 was hulled with a machine patterned after Hibbs's the seed coat consisted of mother tissue, unaffected, germination tests were run on the open seed. Tests were at 25°C in all cases and the tests of the seed were of 63 days duration. Subsequent tests were run with an occasional exception, were chosen from the initial hard-seeded lines. The soft-seeded Strain were likewise selected within the original soft-seeded

The first progeny generation was field grown, but mortality led to greenhouse planting for the balance of the investigation.

Results and Discussion

The mean germination of 303 plants is shown in Table 1. The mean of 57.8% represents an average germination of 90% in 2 days. The degree of permeability varied in a range of 27.4 to 41.4% at 63 days. The rate of germination of these parents and the mean germination of their progeny are illustrated in Fig. 1.

Table 1.—Mean germination of 303 plants selected as hard-seeded and the mean germination of their progeny. It may be observed that the permeability of these parents was 25.47% with a range from 71 to 100%. The rate of germination of the parents and the mean germination of their progeny is illustrated in Fig. 1.

Table 3 presents the germination record of parents selected as hard-seeded and the mean germination of their progeny. It may be observed that the permeability of these parents was 25.47% with a range from 71 to 100%. The rate of germination of the parents and the mean germination of their progeny is illustrated in Fig. 1.