Inheritance of the Anasazi pattern of partly colored seedcoats in common bean

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The genetics of partly colored seedcoats in common bean (*Phaseolus vulgaris* L.) was reviewed by Leakey (1988). A recessive gene (*t*/*t*) enables the various genes controlling specific patterns of partly colored seed to express, whereas *T*/*T* gives self-colored seed. The term “self-colored” describes a seed without partly colored pattern. With *t*/*t* numerous different color patterns are possible, where part of the seed has a nonwhite color and the remainder of the seed coat is pure white. The most extensive studies of the inheritance of partly colored patterns were done by Lamprecht (1934, 1940), Miyake et al. (1930), Prakken (1972), and Schreiber (1934, 1940). Numerous patterns were described in the above papers, and the inheritance of some of the patterns was reported. This paper reports the inheritance of the Anasazi pattern of partly colored seedcoats (Fig. 1).

The inheritance of Anasazi pattern of partly colored seedcoats in common bean (*Phaseolus vulgaris* L.) was studied in a genetic stock *t*ana BC, 5-593 Anasazi BC, 5-593 x *t*z virgarcus BC, 5-593 segregated for two nonparental phenotypic classes and was consistent with the hypothesis that a single recessive gene, with tentative symbol *ana*, produces the Anasazi pattern with *t Z ana* and a new partly colored pattern Anabip with *tz ana*. Thus, the Anasazi factor is not an allele at the *Z* locus. Analysis of 57 random *F*₂ progenies from the cross *t*ana BC, 5-593 x *t*z virgarcus BC, 5-593 supported a genetic model where: 1) with *t Z* the Anasazi phenotype is controlled by a single recessive gene *ana*, i.e., genotype *t Z ana*, 2) the Anabip phenotype has the genotype *tz ana*, and 3) *t Z/z ana* produces a restricted Anasazi pattern. The allelism test cross *t z ana* Anabip BC, 5-593 x *t z f*ₙ white BC, 5-593 produced complementation in the *F*₂, demonstrating nonallelism of *Ana* (actually *Bip*) with the *L* locus. The allelism test cross *t z ana* Anabip BC, 5-593 x *t z bip* bipunctata BC, 5-593 failed to show complementation in *F*₁ and *F*₂, demonstrating allelism of *Ana* with the *Bip* locus. Using bulk segregant analysis we discovered molecular markers linked in coupling to the Anasazi (OM₉, 5.4 cM) and bipunctata (OJ₁₇, 6.0 cM) phenotypes. Allelism was also suggested by the result that the same linkage distance and recombination pattern were observed when the *Ana* marker was used to score the bipunctata population. We propose the gene symbol *bip* for the recessive allele at the *Bip* locus that produces Anasazi pattern with genotype *t Z bip* and the Anabip pattern with genotype *t z bip*. Although *bip* and *bip* are both recessive to *Bip*, their interactions with the *Z* locus are extraordinarily different. The pattern restrictive power of *bip* expresses partly colored pattern with *t Z*, whereas *bip* requires *t z* to express partly colored pattern.
References


Figure 1. The left seed (ventral view); Anasazi partly colored seedcoat pattern. The right two seeds (side views); Anasazi pattern.