Variation within Progeny Derived from Interspecific and Intergeneric Hybridization between Brassicaceae Species

Shi He, Jack Brown, Donna Brown and Lindy Seip
Crop & Weed Science Division, College of Agriculture and Life Sciences, University of Idaho, Moscow, ID, 83844-2339

Introduction

Interspecific and intergeneric hybridization between Brassicaceae species has been useful for increasing genetic variability in plant breeding. Researchers at the University of Idaho have utilized these techniques to develop species hybrid combinations with high seed and plant tissue glucosinolate content for use as biopesticide or green manure crops. However, after selfing, some hybrid offspring show genetic drift towards one of the two species parents. If this occurs there is lower potential for using these techniques in plant breeding. This research was designed to examine the genetic stability of interspecific and intergeneric hybrids after multiple rounds of self pollination.

Materials and Methods

Morphology study

1. Interspecific hybrids used were selected for showing instability in phenotype in previous studies. Hybrid seeds of the 1st and 3rd round of self pollination were planted in a greenhouse.
2. Morphological characters were recorded on each plant. Green plant tissues from each plant were collected for glucosinolate determination. Seeds were harvested at maturity oil and seed meal characteristics were recorded.

Glucosinolate profile determination

The green tissue samples were freeze dried and grinded into powder. Analyze type and concentration of glucosinolate were determined according to method of the Canadian Grain Commission (Daun, *et al.*, 1989).

Results

The data of hybrid varieties BCAS I(*Brassica carinata* x *Sinapis arevensis* I) and BCAS II (*B. carinata* x *S. arevensis* II) are selected to present example from this project.

In BCAS I progeny phenotype drift occurred for cotyledon growth rate (Fig 1), leaf shape (Fig 2) , and glucosinolate profile (Fig.4). Progeny from the later generation were more morphologically similar to the maternal parent .

In BCAS II drift did occur for some morphology characters, such as cotyledon growth rate (Fig 1) and leaf shape (Fig 2) but not for variation of pod size (Fig 3) or glucosinolate profile (Fig 4). Genetic drift in interspecific hybrids were evident in a similar manner in most species combinations.

Conclusion and Discussion

Progeny from BCAS I showed poor potential for breeding green manure cultivars because they lose the ability to synthesizing certain glucosinolates after several rounds of self pollination. Progeny from BCAS II showed potential of developing multiple-purpose green manure cultivars because they contain both allyl and hydroxyl-benzyl glucosinolates. The hydrolyze product allyl has nematacidal properties (Lazzeri *et al.,* 1993), while the latter has bio-herbicide potential. (Borek *et al.,* 1998)

Genetic drift within progeny from interspecific hybridization towards one of the species parents will limit the use of this in plant breeding. Perhaps hybrid chromosome abnormalities cause loss of chromosomes after each round of meiosis, but further investigation will be required to determine the cause of the results found here.

Figure 1(a) Cotyledon length after 1st & 3rd round of BCAS I and BCAS II plus their parents.

Figure 1(b) Cotyledon width after in 1st & 3rd round of BCAS I and BCAS II plus their parents .

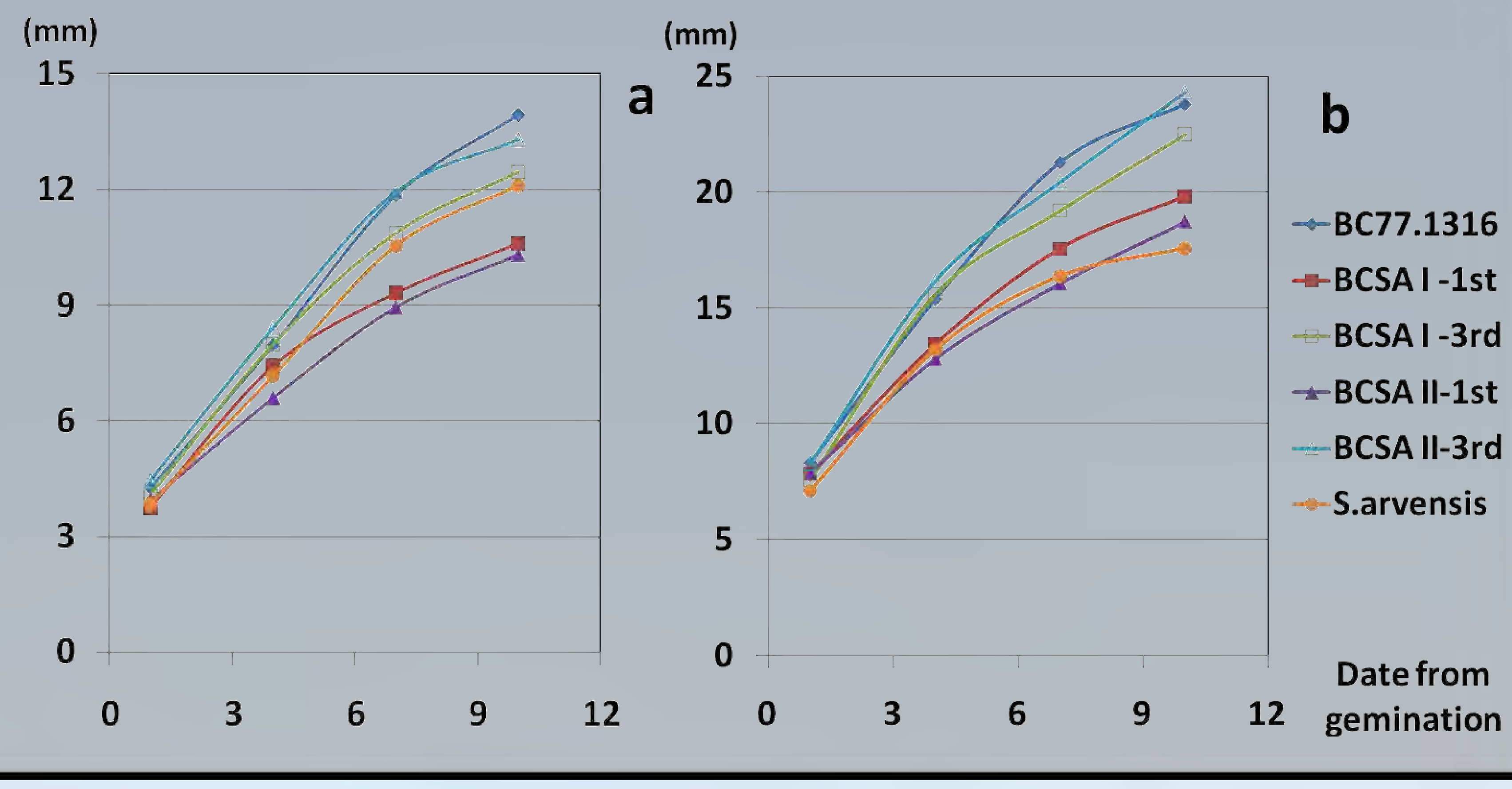
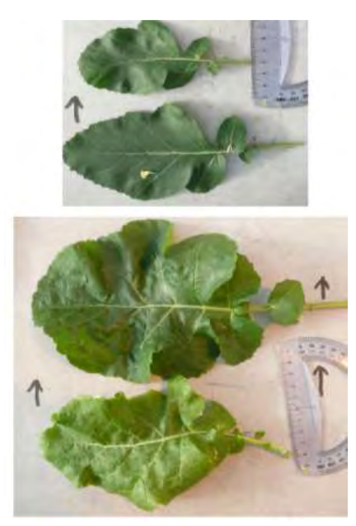


Figure 2. leaf shape of 1st & 3rd round of progeny from BCAS I(*B. carinata X S. arevensis* I) and BCAS II (*B. carinata X S. arevensis* II), plus their parent species

S. arevensis	*B. carinata x S. arevensis* I		*B. carinata x S. arevensis* II		*B. carinata*
	1st generation	3rd generation	1st generation	3rd generation	
					

Morphology data collection with vernier caliper in greenhouse.

Morphology image recorded on pods and petals.

Glucosinolate measurement with GC.

Figure 3 Length of three structures of pods (beak siliqua and pedicle) in 1st& 3rd round of BCAS I and BCAS II progeny, plus their parents

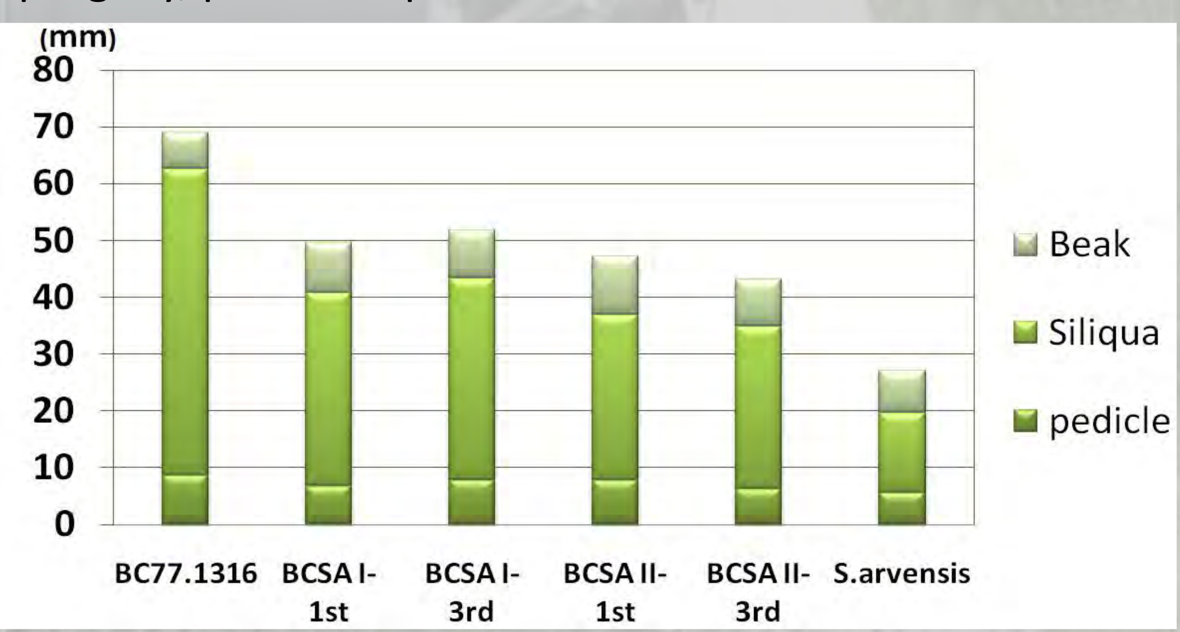
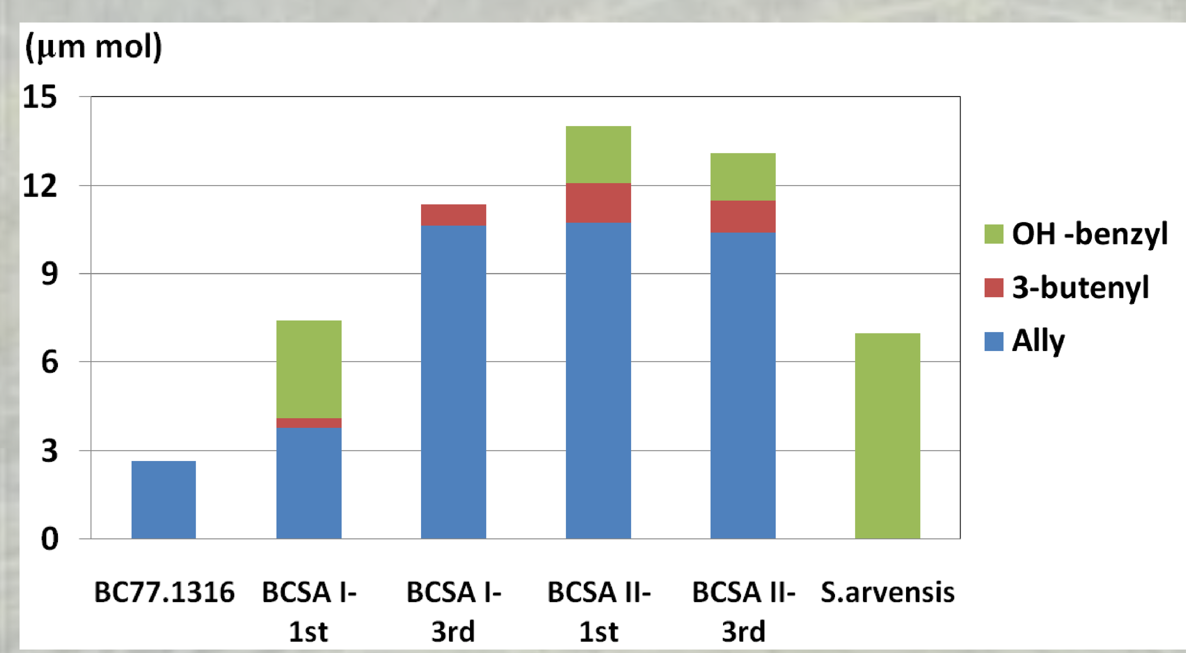


Figure 4. Glucosinolate of 1st & 3rd round of BCAS I and BCAS II progeny, plus their parents .



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