TRAITS EVALUATED BY PLANT BREEDERS IN SNAP BEANS FOR PROCESSING

TRAIT	COMMENTS
Dry seed prior to planting	
White seed color	Anthocyanins from colored seed will influence processed product color.
No obvious defects	Freedom from fish mouth, susceptibility to cracking.
Length: diameter ratio >2:1	Associated with smoother pods.
Germination and Emergence	
Mechanical injury test	Drop seeds 2.6 m onto steel plate placed at 15º angle. Rate for visible cracks and splits. Place mechanically treated seed in moist sterile sand and incubate in the dark at 10ºC for 10 days (no fungicidal seed treatments are applied in this test). Evaluate for percent germination, and defects (ineffective cotyledons, single cotyledons, bald heads and snake heads).
Vegetative growth in the field	
Stand establishment	Percent emerged, defective seedlings.
Days to 50% emergence	
Cotyledon color	Persistent color types may have white cotyledons; normal color is green.
Relative vigor at two weeks	
Reproductive growth in the field	
Days to 50% of plants with at least one flower open.	
Heat susceptibility	Lack of continuous distribution of pods at different maturities when stressed, excessive blanking (lack of seed development) in pods, pollywogs (only seed at distal end of pod developing), fish hooks (extremely curved pods).
Plant architecture	Ideal plant architecture would include thick main stems, short internodes and branches, acute branch angles and pod distribution in upper half of plant.
Lodging	Subdivided into root lodging, and floppy stems and branches.
Maturity	Days to harvest for processing
Concentration of set (Pods similar in maturity)	Pod maturity concentration best evaluated by whether cultivar is still flowering when it has reached harvest maturity. It can be quantified by measuring flowering duration (days to 50% plants finished flowering - days to 50% of plants with at least one flower open).
Ease of pod detachment	Percent of pods breaking at neck vs. pedicle. Some cultivars have the *easy pick* trait where the majority of pods detach at the pedicle abscission zone.
Mechanical harvest ability	Plants strongly rooted, pods accessible to harvester, pods detach singly and easily, correct proportion of vegetation to pods.
Disease evaluation (see BIC Website for disease evaluation techniques)	
Root rots	(*Aphanomyces, Fusarium, Rhizoctonia, Pythium* spp.)
White mold	(*Sclerotinia sclerotiorum*)
Brown spot	(*Psedomonas syringae* pv *syringae*)
Anthracnose	(*Colletotrichum lindemuthianum*)
Common blight	(*Xanthomonas campestris* pv *phaseoli*)
Halo blight	(*Pseudomonas syringae* pv *phaseolicola*)

Bean common mosaic virus	
Bean golden yellow mosaic virus	
Beet curly top virus	
Cucumber mosaic virus	
Post harvest evaluation	
Sieve size distribution	Percent pods graded into one of six sieve classes.
Percent 1-4 sieve	Harvest at 50% 1-4 sieve of full sieve cultivars typically maximizes yield and pod quality.
Total yield (Tons/acre)	
Pod Length (cm)	Short pods (<10 cm five sieve class) are difficult to snip and cut.
Pod Straightness	Straight pods grade more easily, are easier to snip and cut into sections.
Pod Cross Section	Round pods are essential for accurate grading.
Pod Smoothness	Smooth appearance is preferred by processors since bumpy pods suggests over mature pods of low quality and over developed seeds.
Pod Color	Medium to dark green preferred for green beans with a new cultivar blending well with traditional ones. Wax beans should be uniformly yellow, especially in small sieve sizes.
Stringlessness	No pod fiber in sutures should be present.
Interlocular cavitation	No cavities in pod interior between seeds should be present.
Immature seed color	Immature green seed at harvest maturity is required in snap beans compared to immature white seed normally found in dry beans.
Rate of seed development	Slow seed development is preferred although extremes in this trait may result in poor seed production.
Post processing evaluation	
Color intensity	Shade of green meets processor specifications.
Color uniformity	Color from suture to sidewall should be uniform. Suture color should match pod color.
Fiber	Pods should be low in fiber and strings; see Horowitz and Latimer 2005, Official Methods of Analysis of AOAC for method of fiber measurement in snap beans.
Sloughing resistance	Epidermis should not peel away after processing.
Flavor	Varies from processor to processor. Beans should be sweet with a strong “beany” flavor.

[Information provided by James R. Myers, Oregon State University]