Registration of Common Bacterial Blight Resistant Dark Red Kidney Bean Germplasm Line
USDK-CBB-15

Dark red kidney bean (Phaseolus vulgaris L.) germplasm line USDK-CBB-15 (Reg. no. GP-244, PI 639867) was developed by USDA-ARS in cooperation with the Idaho Agricultural Experiment Station and released in 2005. This line was bred specifically for a high level of resistance to common bacterial blight [caused by Xanthomonas axonopodis pv. phaseoli (Smith) Vauterin et al. (Xap)] which is a major seed-transmitted disease that limits kidney bean production in Colorado, Michigan, Minnesota, Nebraska, New York, North Dakota, and Wisconsin. Also, Xap adversely affects seed production in California, Idaho, Washington, Wyoming, and other western states where there is a zero tolerance policy enforced for common bacterial blight and infected fields are plowed down. Genetic resistance in the host provides the most effective control of this disease, and planting certified pathogen-free seed is critical. USDK-CBB-15 possesses two major quantitative trait loci (QTL) and perhaps other minor genes that confer a high level of resistance to Xap. Marker-assisted selection using the SAP6 (Miklas et al., 2003) and SU91 (Pedraza et al., 1997; Miklas et al., 2000) sequence-characterized amplified region (SCAR) markers tightly linked with QTL derived from great northern landrace cultivar Montana No.5 and breeding line XAN 159, respectively, enabled us to expedite development of USDK-CBB-15 to combat this entrenched disease problem in the U.S.

USDK-CBB-15 (previously tested as PS99–009F-5–15–1) derives from a “modified” backcrossing scheme (dark red kidney*4/XAN 159); modified, because a different dark red kidney parent was used for each backcross, and the initial cross underwent two generations of pedigree selection. Thus, USDK-CBB-15 is a modified BC3F1:4 bulk from the cross K97305/3/SVM-2242//I9566–21–4–2/'Montcalm': K97305 is an advanced dark red kidney breeding line from Michigan State University with high yield potential. SVM-2242 is an early-maturing dark red kidney breeding line from Sacramento Valley Milling. I9566–21–4–2 is an F3 derived line from the cross Montcalm/XAN 159 that was selected for presence of SAP6 and SU91 markers in Prosser, WA (USDA-ARS), and resistance to common bacterial blight in greenhouse leaf inoculation assays conducted at the Tropical Agricultural Research Station at Mayagüez, PR. An individual F3 plant (PS99–009F-5–15–1) with a high level of resistance to possess SAP6 and SU91 markers was selected to produce an F4 progeny which was screened for common bacterial blight reaction at Mayagüez. An F4 plant (PS99–009F-5–15–1) with a high level of resistance was selected to produce a BC3F1:4 bulk that was subsequently increased for three generations and evaluated in multiple greenhouse tests until a high level of resistance to common bacterial blight and examined in the field for yield and maturity.

USDK-CBB-15, in a greenhouse leaf assay conducted at Kimberly, ID, in January 2005, had a mean disease score of 2 on the basis of a 1-to-9 scale where 1 is not visibly infected and 9 is completely susceptible. In a common bacterial blight resistant dark red kidney line, USDK-CBB-10, released by USDA-ARS, in 2001 (Miklas et al., 2001), which possesses two major QTL derived from Montana No.5 (via Montcalm) and tepary bean (via XAN 159), respectively. Thus, USDK-CBB-15 possesses a much higher level of resistance to common bacterial blight than USDK-CBB-10 and Montcalm.

USDK-CBB-15 exhibits a Type I determinant resistance habit typical of kidney bean. Yield was 108% of the check (dark red kidney (Kelly et al., 1995) at Othery, Michigan. Average weight of 100 seeds was 52 g and earliness was 3 days ahead of the susceptible check. The dark red kidney appearance was rated commercially acceptable for the dark red kidney market class. USDK-CBB-15 also exhibited a sensitive resistance response to the NL-3 strain of Bean common mosaic necrosis virus (BCMV) in house tests, which infers presence of the I gene for resistance to Bean common mosaic virus (BCMV).

USDK-CBB-15 will be most useful for introduction to common bacterial blight in the dark red kidney market class, but also other large-seeded Andean dry and garden beans.

Seed will be maintained by USDA-ARS at the Great Northern Experiment Station and released in 2005. This germplasm contributes to the development of a new line.

P.N. Miklas,* J.R. Smith

References

