Registration of Partial White Mold Resistant Pinto Bean Germplasm Line USPT-WM-1

Pinto bean (*Phaseolus vulgaris* L.) germplasm line USPT-WM-1 (Reg. no. GP-262, PI 642448) was developed by USDA-ARS in cooperation with the North Dakota State Agricultural Experiment Station and the Agricultural Experiment Station of Michigan State University and released in 2005. This line was bred specifically for resistance to white mold caused by the fungal pathogen *Sclerotinia sclerotiorum* (Lib.) deBary. White mold is the major economic disease problem of dry bean production in the USA and is a particularly severe problem in pinto beans because of their high degree of susceptibility to the disease. White mold is endemic in all production regions of the USA and is most problematic under moist conditions resulting from rainfall or excessive irrigation during the flowering and midpod fill stages. The partial resistance in USPT-WM-1 derives from ‘ICA Bunsi’ navy bean (synonymous with ‘Ex Rico 23’ in Canada), which is a well-known source of resistance to white mold (Tu and Beversdorf, 1982).

USPT-WM-1 (previously tested as AN-37) derives from a recombinant inbred population (Miklas et al., 2004) from the cross ‘Aztec’/ND88–106–04. Aztec is a semi-upright pinto bean cultivar from Michigan State University that is susceptible to white mold (Kelly et al., 1992). ND88–106–04, from the cross N85007/ICA Bunsi, is an upright navy bean breeding line from North Dakota State University with resistance to white mold putatively derived from ICA Bunsi. USPT-WM-1 is an F5-derived bulk from an individual F2 plant that underwent generation advance by random single-seed descent method for four generations from F2 to F5.

USPT-WM-1 was selected on the basis of partial resistance to white mold and agronomic characteristics across four white mold field environments in North Dakota and Washington in 2001 and 2002 (Miklas et al., 2004). Across environments, mean disease score based on a subjective scale from 1 to 9, where 1 is no visible infection and 9 is a completely susceptible reaction, was 3.7 for USPT-WM-1 compared with 6.8 for Aztec and 5.0 for ICA Bunsi. The line exhibits disease avoidance characteristics: upright Type IIb growth habit; open canopy score of 2.4, where 1 is a completely open and 5 a completely closed canopy, compared with scores of 2.7 for Aztec and 3.7 for ICA Bunsi; taller canopy height of 49 cm, compared with 41 and 44 cm for Aztec and ICA Bunsi; and reduced lodging score of 3.9, where 1 is no lodging and 9 completely lodged, compared with 6.2 Aztec and 6.3 for ICA Bunsi. The line has midseason 94-d maturity, compared with 90 d for Aztec and 96 d for ICA Bunsi. USPT-WM-1 exhibits the stay-green stem trait with a score of 2.6, where 1 = 0 to 20% and 5 = 80 to 100% stay-green stem, compared with 1.8 and 3.8 scores for Aztec and ICA Bunsi, respectively. The stay green trait is described as pods reaching harvest maturity while the branches remain green. Thus, the plant is still likely to be physiologically active and engaged in plant defense response (Miklas et al., 2004). Seed size based on weight of 100 seeds was 33.6 compared with 33 g for Aztec; however, in the absence of 12 separate greenhouse and field tests in 2001 and 2002, the next highest yielding pinto beans were 34 g for Buster. Harvest maturity was 93 d, compared with 90 d for Aztec and 96 d for ICA Bunsi. USPT-WM-1 was selected on the basis of partial resistance and resistance in a cross ‘Aztec’/ND88–106–04 and its tight association with the *B* locus, derived from the navy bean parent ND88–106–04. Aztec is a semi-upright pinto bean cultivar from Michigan State University that is susceptible to white mold (Tu and Beversdorf, 1982).

USPT-WM-1 will be most useful for incorporation of resistance to white mold primarily in the pinto bean market, but also in the medium-seeded great northern, pink, and small red market classes as well. Seed will be maintained in the ARS at Prosser, WA, and provided in small quantities on written request. We ask that appropriate recognition of source be given when this germplasm contributes to the development of a new cultivar or germplasm line.

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References


Tu, J.C., and W.D. Beversdorf. 1982. Tolerance to white mold and agronomic characteristics across four white mold field environments in North Dakota and Washington in 2001 and 2002 (Miklas et al., 2004). Across environments, mean disease score based on a subjective scale from 1 to 9, where 1 is no visible infection and 9 is a completely susceptible reaction, was 3.7 for USPT-WM-1 compared with 6.8 for Aztec and 5.0 for ICA Bunsi. The line exhibits disease avoidance characteristics: upright Type IIb growth habit; open canopy score of 2.4, where 1 is a completely open and 5 a completely closed canopy, compared with scores of 2.7 for Aztec and 3.7 for ICA Bunsi; taller canopy height of 49 cm, compared with 41 and 44 cm for Aztec and ICA Bunsi; and reduced lodging score of 3.9, where 1 is no lodging and 9 completely lodged, compared with 6.2 Aztec and 6.3 for ICA Bunsi. The line has midseason 94-d maturity, compared with 90 d for Aztec and 96 d for ICA Bunsi. USPT-WM-1 exhibits the stay-green stem trait with a score of 2.6, where 1 = 0 to 20% and 5 = 80 to 100% stay-green stem, compared with 1.8 and 3.8 scores for Aztec and ICA Bunsi, respectively. The stay green trait is described as pods reaching harvest maturity while the branches remain green. Thus, the plant is still likely to be physiologically active and engaged in plant defense response (Miklas et al., 2004). Seed size based on weight of 100 seeds was 33.6 compared with 33 g for Aztec; however, in the absence of corresponding data for USPT-WM-1, it is unclear how this comparison was made.

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