Registration of ‘Nitrasoy’ Soybean

‘Nitrasoy’ soybean [Glycine max (L.) Merr.] germplasm (Reg. no. CV-483, PI 642732) was cooperatively developed and released by the USDA Agricultural Research Service and the North Carolina Agricultural Research Service in April 2006. Nitrasoy is a nonnodulating group VI maturity soybean with a large requirement for soil-applied nitrogen to obtain excellent seed yield. Nitrasoy provides a leguminous crop option for land application of animal waste, previously unavailable using commercial soybean varieties. It is also a very useful research tool for studying the effects of microbial symbiotic and asymbiotic N fixation on soybean productivity. It is adapted to southern USA, 27 to 37° N latitude.

Nitrasoy is an F₅-derived selection from the cross D68-0099/‘Cook’ (Boerma et al., 1992). D68-0099 (PI 573285) is a backcross derived breeding line from the cross of ‘Lee’®/PI 548192. PI 548192 is the donor parent of the nonnodulating gene, rj, which when homozygous, prevents the nodulation of the soybean root system by Bradyrhizobium japonicum and Bradyrhizobium elkanii. Lee is a group VI maturity cultivar developed by USDA-ARS at Stoneville, MS (Johnson, 1958), and Cook is a high yielding group VIII maturity cultivar developed by the Georgia Agricultural Experiment Station.

During the 1996–1997 winter, F₁ plants were grown and advanced to the F₂ generation at the USDA-ARS Tropical Agricultural Research Station (TARS), Isabella, PR. The F₂, F₃, and F₄ generations were advanced using the single seed descent breeding method (Brim, 1966) at Clayton, NC, in 1997, at TARS in the 1997–1998 winter nursery, and at Clayton in 1998, respectively. In 1999, individual F₃ plants were grown at Clayton, NC, and selected for inability to nodulate. In 2000, F₅₆ plant rows were grown, harvested, and selected for yield and other agronomic traits. N99-3341 was renamed Nitrasoy on its public release. Yield performance of Nitrasoy and its two parents, Cook and D68-0099, was tested in 2002 at the Central Crops Research Station near Clayton, NC, with seven soil-applied nitrogen rates (0, 49, 99, 148, 197, 246, and 296 kg ha⁻¹ of N as ammonium nitrate). The seed yield of the nodulating variety Cook averaged 3240 kg dry wt. ha⁻¹ with no yield difference across the applied N rates. Nitrasoy and D68-0099 had similar seed yields (1525 kg dry wt. ha⁻¹) at the 0 N treatment, but the yield of Nitrasoy at the optimum rate, 246 kg ha⁻¹, had 16% higher seed yield than its nonnodulating parent, D68-0099, (3086 kg ha⁻¹ versus 2652 kg ha⁻¹).

In 2001, experiments were conducted at two NC locations (a farm in Sampson County, and the Central Crops Research Station) with four non-nodulating genotypes (D68-0099, N97-2996, Nitrasoy, and N99-3342) and three nitrogen levels applied as swine-lagoon effluent. The average seed yield of Nitrasoy was greater than the other three genotypes. Nitrasoy yielded 3246 kg dry wt. ha⁻¹ and 3155 kg dry wt. ha⁻¹ at the highest levels of applied N, 296 kg ha⁻¹ plant available N at the Central Crops Research Station and Sampson County, respectively.

Nitrasoy recovered 17% more soil applied N (D68-0099 (193 kg N ha⁻¹ versus 165 kg N ha⁻¹)). Nitrasoy is considered an excellent choice as an N receiver crop for animal waste. Corn-wheat-double cropped soybean (nodulated) is a common cropping system on fields receiving swine-lagoon effluent. Substitution of non-nodulated Nitrasoy into this system for a nodulated soybean variety improves recovery of nitrogen applied in animal waste.

Nitrasoy is also a useful tool for studying effects of symbiotic and asymbiotic N fixation on soybean. Positive effects of symbiotic N fixation by soybean are well known. Effects of associated free-living N fixing bacteria, such as Azotobacter, are known, even though they are routinely included in soybean inoculums, and are known to enhance symbiotic N fixation (Bishop et al., 1981). Nitrasoy provides a very useful tool for the study of these effects.

Nitrasoy has purple flowers, tawny pubescence, and tan pod walls. Hila color varies (mostly black with some brown). Its susceptibility to common soybean diseases is not known, even though they are routinely included in soybean inoculums, and are known to enhance symbiotic N fixation (Burns et al., 1981). Nitrasoy provides a very useful tool for studying effects of symbiotic and asymbiotic N fixation on soybean.

Seed is available from North Carolina Soybean Producers, Inc. (8220 Riley Hill Road, Zebulon, NC 27597-8773, USA, telephone 919-269-5592). Small quantities of Nitrasoy will be available for research purposes from the author. It is requested that appropriate recognition be made if this germplasm contributes to the development of a germplasm line or cultivar. Seed will also be available from the National Center for Genetic Resources Preservation and National Plant Germplasm System.

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References


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