Registration of Soybean Germplasm Lines LG97–7012, LG98–1445, and LG98–1605

The soybean [Glycine max (L.) Merr.] germplasm lines LG97–7012 (Reg. no. GP-317, PI 639283), LG98–1445 (Reg. no. GP-318, PI 639284), and LG98–1605 (Reg. no. GP-319, PI 639285) were cooperatively developed and released in 2001 by the USDA-ARS and the Illinois Agricultural Experiment Station for use as parental lines in yield improvement programs. These maturity group II and III lines combine high yield with unique genetic diversity not currently present in the commercially used gene pool in the USA.

All three lines were developed through an early generation testing procedure. The progenitor populations were tested for yield as F2 families in the F1, and F2 generations. The released lines were derived from single-plant selections made in the F3 generation and bulk harvested in the F4.

LG97–7012 is an F2 selection from LG89–1525 × ‘A3322’. A3322, a selection from ‘A4268’ × X836 (‘Williams’ × ‘Mack’), was used as a parent with permission of the Asgrow Seed Company. LG89–1525 is an F2 selection from PI 90566–1 × L74–3897 (Bernard et al., 1987a). L74–3897 is an F2 selection from ‘Williams’ × ‘Beeson’ (Bernard and Lindahl, 1972; Probst et al., 1989). This is the first germplasm release that has PI 90566–1 as a progenitor. LG97–7012 has indeterminate stem termination and is classified as early group III maturity. It has white flowers, tawny pubescence, tan pods, yellow seed coat, and buff hilum color. In testing at nine locations in the USDA Uniform Preliminary Test IIB in 2001, LG92–7012 yielded 3050 kg ha$^{-1}$, exceeding the yield of the highest yielding cultivar in the test, ‘IA2052’, by 4% and maturing 2 d later than IA2052 (Wilcox 2001). In 2002 at 19 locations in the USDA Uniform Preliminary Test III, LG97–7012 yielded 3050 kg ha$^{-1}$ (Wilcox 2002), which was 4% higher yielding and 5 d later than IA2052 but 11% lower yielding and 2 d earlier than IA2052 but 5% lower yielding and 3 d later than IA2052 but 3 d earlier than IA3010 (Wilcox 2002). LG97–7012 has nearly the same protein (409 vs. 408 g kg$^{-1}$) and oil concentration (194 vs. 189 g kg$^{-1}$) and lodging scores (1.4 vs. 1.2 on a 1-to-5 scale), was taller (76 vs. 66 cm), and had larger seeds (175 vs. 14.9 g 100 seeds$^{-1}$) than IA3010 (Wilcox 2002). LG97–7012 has a mixed reaction to race 4 and is resistant to race 7 of Phytophthora sojae Kaufmann & Gerdemann.

LG98–1445 is an F3 selection from LG91–7431 × ‘Pioneer 9273’. Pioneer 9273, a selection from the cross of Pioneer 2981 × A3127, was used as a parent with permission of Pioneer Hi-Bred International. LG91–7431 is an F2 selection from LG84–1272 × ‘Elgin’ (Fehr and Bahrenpus, 1984). LG84–1272 is an F2 selection from PI 227333 × PI 91730–1 (Bernard et al., 1987a, 1987b). LG98–1445 has indeterminate stem termination and is classified as early group III maturity. It has purple flowers, tawny pubescence, brown pods, yellow seed coat and black hilum color. In testing at nine locations in the USDA Uniform Preliminary Test IIB in 2001, LG98–1445 yielded 3407 kg ha$^{-1}$, which was the same as the highest yielding cultivar in the test, IA2052. LG98–1605 was 1.5 d earlier than IA2052 and was nearly the same in protein (404 vs. 403 g kg$^{-1}$) and oil concentration (213 vs. 215 g kg$^{-1}$), lodging scores (1.4 vs. 1.3 on a 1-to-5 scale), and seed size (14.7 vs. 15.1 g 100 seeds$^{-1}$) but was slightly taller (81 vs. 74 cm) than IA2052 (Wilcox, 2001). LG98–1605 is susceptible to race 4 and has a mixed reaction to race 7 of Phytophthora sojae Kaufmann & Gerdemann.

LG98–1605 is an F3 selection from PI 404157 × PI 384469A (Bernard et al., 1987b). LG85–2846 is an F2 selection from PI 404157 × PI 384469A (Bernard et al., 1987b). This is the second germplasm release for high yield that is derived solely from exotic germplasm not previously used in commercial U.S. soybean breeding (Warburton et al., 2004). It is the first release derived from six introductions and the first in which PI 404157 and PI 384469A are progenitors. LG98–1605 has indeterminate stem termination and is classified as late group II maturity. It has white flowers, tawny pubescence, brown pods, yellow seed coat and yellow hilum color. In testing at nine locations in the USDA Uniform Preliminary Test IIB in 2001, LG92–1605 yielded 3279 kg ha$^{-1}$, which was the same as the highest yielding cultivar in the test, IA2052. LG98–1605 was 1.5 d earlier than IA2052 and was nearly the same in protein (404 vs. 403 g kg$^{-1}$) and oil concentration (213 vs. 215 g kg$^{-1}$), lodging scores (1.4 vs. 1.3 on a 1-to-5 scale), and seed size (14.7 vs. 15.1 g 100 seeds$^{-1}$) but was slightly taller (81 vs. 74 cm) than IA2052 (Wilcox, 2001). LG98–1605 is susceptible to race 4 and has a mixed reaction to race 7 of Phytophthora sojae Kaufmann & Gerdemann.

The nine exotic parental lines (PI 90566–1, PI 91730–1, PI 227333, PI 253665D, PI 283331, PI 361064, PI 384469A, PI 404157, and PI 407710) are in maturity group I, II, or III. PI 90566–1 and PI 91730–1 were imported from Jilin, China, in 1930 and 1931, respectively (Bernard et al., 1987a). PI 227333 was imported from Hokkaido, Japan, in 1995 with the name ‘Ohozyu’ (Bernard et al., 1987b). PI 253665D originated in China and was brought to the USA in 1958 (Bernard et al., 1987b). PI 283331 came from Morocco in 1958 (Bernard et al., 1987b). PI 361064 is an experimental line that was developed in Yugoslavia and brought to the USA in 1971 (Bernard et al., 1987b). PI 384469A was imported from Krasnodar in the current Russian Federation in 1974 as the named cultivar ‘Kubanskaia 33’ (Bernard et al., 1987b). PI 404157 is the Russian cultivar Primorskaja 494 imported from Primorye in 1975 (Bernard et al., 1987b). PI 407710 is a primitive Chinese cultivar obtained from Heilongjiang province in 1976 (Bernard et al., 1987b). These introductions do not occur in the pedigrees of any released cultivars in the USA, but PI 91730–1, PI 227333, PI 253665D, PI 283331, PI 361064, and PI 407710 are progenitors of other released germplasm lines at our research (Brown-Guedira et al., 2004; Warburton et al., 2004).

The nine exotic accessions used to develop these experimental lines have been characterized by random amplified polymorphic DNA (RAPD) fragments and compared with the major ancestral lines of current U.S. cultivars (Brown-Guedira et al., 2000). These accessions were classified into six different genetic groups. PI 227333, PI 253665D, PI 404157, and PI 407710 are in the same genetic group as the ancestral line ‘Korean’. On the basis of pedigree analysis, Korean contributes less than 1% of genes to current U.S. cultivars (Gizlice et al., 1994). PI 361064 was grouped with the major U.S. ancestral lines ‘S-100’, ‘Lincoln’, ‘Illini’, and ‘A.K. (Harow)’ when the clustering was based on 109 RAPD fragments and three simple sequence repeat (SSR) loci (Brown-Guedira et al., 2000) but did not cluster with any U.S. ancestral lines or exotic accessions and was classified as an outlier when the clustering was based on 281 RAPD fragments (Thompson et al., 1998). PI 90566–1 was clustered with the ancestral lines ‘Dunfield’ and ‘Mukden’ that contributed 7% of the genes to current U.S. cultivars (Gizlice et al., 1994). PI 91730–1 was grouped with ‘Richland’ and ‘Haberlandt’. These two ancestral lines are estimated to have contributed 9% of the genes to the current U.S. soybean gene pool (Gizlice et al., 1994). PI 283331 and PI 384469A were classified into two different genetic groups neither of which contained any of the major U.S. ancestral lines.

Seeds of LG97–7012, LG98–1445, and LG98–1605 will be deposited in the USDA Soybean Germplasm Collection and
may be requested from the corresponding author for research purposes, including development and commercialization of new cultivars. E-mail requests are welcome. It is requested that appropriate recognition be made if this germplasm contributes to the development of a new breeding line or cultivar.

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References


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