Register of Australian Herbage Plant Cultivars

A. Grasses
3. Phalaris
Phalaris aquatica L. (phalaris) cv. Atlas PG

Reg. No. A-3a-10
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Origin

The breeding of Atlas PG began in 1982 with the crossing of 6 Moroccan accessions of *Phalaris aquatica* L. var. *hirtiglumis* Batt. and Trab. to 2–6 seed-retaining plants, each of which had a Moroccan accession as one grandparent. The Moroccan accessions were the US cultivar, Perla koleagrass (Adams *et al*. 1974), and the Commonwealth Plant Introduction numbers 14696, 19305, 19306, 19315 and 19331. CPI 19315 is the only known population of phalaris which can largely exclude sodium and chloride ions from its leaf tissue when the roots are grown in a nutrient solution with a salt concentration equal to one-quarter that in seawater (Oram *et al*. 1993). Selection for the Seedmaster type of seed retention in 19305 and 19331 gave the cultivars El Golea and Sirocco, respectively (Oram 1990), but this mechanism is relatively ineffective in winter-active phalaris.

The plants resulting from these crosses were interpollinated and some also were backcrossed to seed-retaining plants. The seed retainers recovered from the F_2 and backcross populations were crossed to Perla koleagrass and to other Moroccan accessions. These F_1s were intercrossed to form a base population to which Perla koleagrass contributed 41% of the germplasm, other Moroccan accessions 19%, Australian 25%, and Holdfast progenitors 15%. The next 4 segregating generations were selected for seedling vigour, moderate height, higher tiller number, high herbage yield, bud dormancy in summer, and seed retention. Large tuber size was added as a selection criterion in the last 2 generations. In most generations, it was also possible to select for resistance to stem rust and leaf-browning diseases. The 45 plants selected in the final generation were interpollinated in isolation, and their open-pollinated progenies were evaluated in plots at Wagga Wagga, Coolah and Merriwa, New South Wales, in 1992–95 under the breeder's name of 'Perla Retainer'. The drought of 1994 was particularly severe at the latter 2 sites. The data collected from these trials was used to construct an index of family performance which included establishment ability, productivity, drought survival and recovery from drought, with emphasis on the latter 2 traits. The parents of the 10 families with the highest values of the index were chosen as the founders of the new cultivar.

Atlas PG (syn. Perla Retainer) was recommended for registration by the NSW Pasture Variety Committee and has been protected by Plant Breeders Rights (Anon. 1998).

Morphological description

Atlas PG is a winter-active phalaris cultivar which resembles Sirosa, Sirolan, Holdfast and Landmaster in having large, erect and sparse tillers, long and broad leaf blades, and thick, tall flowering culms. In a spaced plant trial, the mean lengths of the longest stem, including the panicle, of Atlas PG, Sirocco, Sirolan and Perla koleagrass were 170, 178, 162 and 172 cm respectively (Anon. 1998). The frequencies of plants with hairy outer glumes in Atlas PG, Sirocco, Sirolan and Perla koleagrass are 88, 98, 68 and 100% respectively. The frequencies of seedlings with red root tips in these cultivars are 74, 90, 50 and 71% respectively. The underground buds at the base of flowering culms have a high level of dormancy following summer rains. Unlike Sirocco, the mature seeds of Atlas PG remain attached to the pedicels of the seed parent because the rachillae remain intact at maturity, a mechanism first discovered by H. E. Schroeder and later described by McWilliam and Gibbon (1983). This feature distinguishes Atlas PG from all other phalaris cultivars with summer-dormant buds. The panicle branches of 90% of Atlas PG plants also remain intact for several weeks after maturity, whereas panicle shattering occurs extensively soon after ripening in 76% of Sirocco plants, 36% of Sirolan plants, and 80% of Perla koleagrass plants.

Agronomic characteristics

Atlas PG is designed to be similar agronomically to Sirocco, which extended the phalaris belt into drier districts

(Meakins 1973), but which had low seed yields. The seed retention capacity of Atlas PG will ensure an adequate supply of seed at a reasonable price, and will allow cereal growers to harvest their own seed.

Atlas PG was superior to Sirocco in vigour and plant density during the first 1 or 2 years at Wagga Wagga and Coolah, but was inferior in later years. A similar pattern emerged at Merriwa, except that Atlas PG and Sirocco were equal in the fourth growing season. Australian and Sirolan also scored well at all sites, apparently because rainfall was sufficient to support the growth of shoots developing in summer.

Near Canberra, Atlas PG flowered at similar times as Sirolan, Australian and Holdfast, which flowered 3 days later than Sirocco and 4 days later than Perla koleagrass. Atlas PG buds were somewhat less dormant in the 1994–95 summer, and equally dormant in the 1997–98 summer (Anon. 1998), relative to those of Perla koleagrass and Sirocco, but appreciably more dormant than those of Sirolan and Holdfast in both years. The concentrations of toxins in the herbage of Atlas PG have not been compared directly with those of Sirocco, but an indirect comparison via Australian suggests that there are lower levels of the tryptamine alkaloids in Atlas PG. These alkaloids are considered to be responsible for the chronic disease, phalaris staggers (Bourke 1992). However, Atlas PG has a high concentration of N-methyltyramine, one of the toxins thought to cause sudden death in ruminants (Anderton *et al.* 1994).

Methods devised for the establishment of summer-dormant Moroccan ecotypes in the wheatbelt and adjacent higher rainfall grazing lands of south-eastern Australia, under cereal crops (Hoen and Oram 1967; Oram and Hoen 1967), or from spring sowings (Oram 1965), also would be appropriate for Atlas PG.

Summer dormancy of the underground buds leads to better long-term survival of phalaris stands in districts with a long, hot summer, which is interrupted by 1 or 2 brief cooler, moist intervals (Oram 1983; Oram and Freebairn 1984), because most of the buds remain dormant until the following autumn, when soil moisture is more likely to be available continuously. However, summer dormancy of the buds is a disadvantage if the shoots developing in response to summer rain have a continuous supply of water through the remainder of the summer and autumn. Less dormant cultivars such as Sirolan and Holdfast then have an advantage over the summer-dormant cultivars because the former are better able to compete with autumn-germinating annuals (Oram and Freebairn 1984). Greater animal production on the summer active cultivars, Sirosa and Holdfast, than on a precursor of Atlas PG also has been demonstrated in a grazing trial near Canberra, where the summer and autumn seasons are often mild and wet (Culvenor and Oram 1996; Culvenor *et al*. 1996; Culvenor 1997).

Like all erect, winter-active cultivars of phalaris, Atlas PG stands will thin out prematurely if continuously grazed by sheep, especially if the soil is acid, low in phosphorus and/or is shallow (Conroy 1995). Therefore, pastures containing a winter-active phalaris such as Atlas PG should support more animal production and will maintain a better botanical composition if grazed rotationally or with some other system of heavy grazing alternating with spells of 4–6 weeks for recovery during summer, autumn and winter than will set-stocked pastures. In dry districts, continuous grazing during spring with moderate stocking rates up to 1.5–2.0 times the district average is recommended, rather than rotational grazing (Oram 1995).

The role of perennials in pastures in sustainable grazing and cropping systems is now widely appreciated, so Atlas PG is expected to play an important part at the drier edges of the main phalaris belt as the sole perennial component and in mixtures with other species, especially lucerne.

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