

Register of Australian Herbage Plant Cultivars

B. Legumes

8. Lucerne

(a) *Medicago sativa* L. (lucerne) cv. Aquarius

Reg. No. B-8a-21

Registered 17 September 1992

Originators: D. B. Waterhouse^A and R. W. Williams^B

^A NSW Agriculture, Tamworth Agricultural Research Centre, RMB 944, Tamworth, N.S.W. 2340, Australia.

Present address: Soil Conservation Service of NSW, Research Station, Cowra, N.S.W. 2794, Australia.

^B NSW Agriculture, Yanco Agricultural Institute, PMB, Yanco, N.S.W. 2703, Australia.

Registrar: R. N. Oram

CSIRO Division of Plant Industry, GPO Box 1600, Canberra, A.C.T. 2601, Australia.

Released by NSW Agriculture

Australian Journal of Experimental Agriculture, 1993, 33, 257–8.

Origin

Aquarius was bred by NSW Agriculture at the Yanco Agricultural Institute. The breeding team comprised D. B. Waterhouse and R. W. Williams, with assistance from A. J. Milvain, T. M. O'Brien, C. M. Rose, G. F. Lonergan, and W. H. Jackson. The initial material was bred and selected by G. G. Drummond, J. A. G. Irwin, D. B. Waterhouse, M. E. Lattimore, A. J. Milvain, I. A. Cole, P. G. H. Nichols, and M. M. Say. Naming follows the system developed for lucernes bred by NSW Agriculture, in which the cultivar name is associated with a celestial or atmospheric object and its primary use. Thus, Aquarius is designed for wet areas such as under irrigation or in high rainfall situations.

Aquarius was developed by crossing a breeding population derived from the highly winter-active cultivar, CUF-101 (Nielson and Lehman 1976) with elite clones from an experimental line, NAPB 0310. Plants from CUF-101 were initially selected in the field in 1979 at Windsor, New South Wales, for resistance to stem nematode [*Ditylenchus dipsaci* (Kühn) Filipjev] and to leaf diseases including stemphylium leaf spot (*Stemphylium botryosum* Wallr.) and pepper spot [*Leptosphaerulina trifolii* (Rost.) Petr.]. These selections were polycrossed by hand and the progeny screened for resistance to leaf disease in the field at Nowra, New South Wales, and for resistance to blue-green aphid (*Acyrtosiphon kondoi* Shinji) and colletotrichum crown rot (*Colletotrichum trifolii* Bain. et Essary) in the greenhouse at Yanco. Plants from this second cycle of selection were hand-crossed using pollen from clones of NAPB 0310 selected for major resistance genes to phytophthora root rot

(Irwin *et al.* 1981). Progeny from this cross were further screened for resistance to blue-green aphid and to spotted alfalfa aphid [*Therioaphis maculata* (Buckton)] in the greenhouse and were polycrossed to form Aquarius.

Selection for resistance in each of the last 2 generations was practised within and among half-sib families, using large numbers of plants to avoid inbreeding depression. Aquarius is a synthetic cultivar, based on 97 plants in the final generation.

Aquarius was submitted for registration by NSW Agriculture, which will maintain breeder's seed. Recommended for registration by the New South Wales Herbage Plant Liaison Committee. An application for PVR protection of this cultivar will also be submitted.

Morphological description

The crowns of Aquarius plants are densely branched and are more spreading and less erect than CUF-101 and other highly winter-active lucernes. For example, after 1 year in an irrigated trial at Leeton, New South Wales, spaced plants of Aquarius had an average crown area of 39 cm². This was 26% larger than CUF-101, 46% larger than WL605, and 31% larger than P577, P5929, and Sequel (S. P. Young and R. W. Williams unpublished data). Flower colour is predominantly purple to mauve (85.2%), with a low proportion of plants with lilac flowers (14.8%), and no variegated types.

Agronomic characters

Aquarius was bred to provide a persistent, highly winter-active lucerne for haymaking and/or grazing in irrigated or high rainfall environments. The main cause of the poor persistence and declining production of lucerne stands in these wet environments is phytophthora root rot (Irwin *et al.* 1977; Rogers *et al.* 1978). Aquarius is significantly more resistant to phytophthora root rot than all previous cultivars, including the resistant cultivar Aurora. For example, following the exposure of seedlings to phytophthora root rot in a greenhouse, Aquarius had 65% survivors, Aurora 20%, Sequel 10%, Trifecta and CUF-101 9%, Siriver 6%, and Hunter River 2% (I. D. Kaehne, R. W. Williams, J. A. Horsnell, B. M. Martin and E. T. Kobelt unpublished data). In a severe test using different isolates of phytophthora, 44% of Aquarius seedlings survived exposure compared with only 7% for Aurora and 2% for Hunter River (T. M. O'Brien and R. W. Williams unpublished data). Aquarius is the first cultivar in Australia to be given a 'High resistance' classification for resistance to phytophthora root rot.

Aquarius is also more resistant to colletotrichum crown rot than CUF-101 and Hunter River but is less resistant than Aurora and Sequel. In a greenhouse test at Yanco, 21% of

Aquarius seedlings survived inoculation with colletotrichum compared to 10% for CUF-101, 6% for Hunter River, 30% for Aurora, and 52% for Sequel (T. M. O'Brien and R. W. Williams unpublished data). A greenhouse test for resistance to stemphyllium leaf spot (I. D. Kaehne, R. W. Williams, J. A. Horsnell, B. M. Martin and E. T. Kobelt unpublished data) suggested that Aquarius, with 47% survivors, was similar to CUF-101 and Sequel with 37 and 38% survivors, respectively, but was inferior to Siriver with 58% survivors and Quadrella with 61%.

Fewer stem nematodes were extracted from plants of Aquarius than from plants of other cultivars at Singleton, N.S.W. (D. B. Waterhouse and C. M. Rose unpublished data). Aquarius plants contained 2170 nematodes per 100 g. This was 34% of the number extracted from Trifecta plants, 28% of the number from CUF-101, and only 3% of the number from Sequel. Aquarius is therefore classed as moderately resistant to stem nematodes. Aquarius is also moderately resistant to damage from blue-green aphids and had a survival index in a greenhouse test of 103. This was similar to Aurora with a survival index of 113, Siriver with 100, and CUF-101 with 99, but was significantly greater than Hunter River with 97, Trifecta with 94, and P577 with 86 (A. J. Milvain and R. W. Williams unpublished data). The resistance of Aquarius to spotted alfalfa aphid is comparable to that of other resistant cultivars. For example, both Aquarius and CUF-101 had 83% seedling survivors; this was similar to Aurora and Siriver with 92%, and Sequel with 80%, but was significantly greater than Trifecta with 67% and Hunter River with 1% survivors (I. D. Kaehne, R. W. Williams, J. A. Horsnell, B. M. Martin and E. T. Kobelt unpublished data).

This combination of resistances to pests and diseases confers on Aquarius the potential to persist, and therefore to maintain production, in irrigated and/or high rainfall conditions. Aquarius averaged 163% of the site mean frequency of plants remaining after at least 4 years across 4 irrigated trials in N.S.W. compared with 51% for CUF-101 and 64% for Baron. Furthermore, Aquarius yielded an average

111% of the site mean for the first 2 years of these trials and was superior to its more winter-active parent, CUF-101 (99% of the site mean) and to all other cultivars in these trials. This initial yield advantage for Aquarius increased throughout these trials as herbage production became more dependent on plant persistence.

Aquarius has also shown greater than average yield and persistence in dryland trials at both Yanco (A. J. Milvain and R. W. Williams unpublished data) and Tamworth (D. B. Waterhouse, C. M. Rose and G. F. Lonergan unpublished data). Nevertheless, the advantages of Aquarius over other highly winter-active cultivars are best expressed where phytophthora root rot is the main limitation to lucerne growth and development. Therefore, the primary use of Aquarius will be as a general purpose, highly winter-active lucerne for sustainable production under irrigated and/or high rainfall conditions.

Acknowledgments

The Wool Research and Development Corporation partially funded the development and evaluation of Aquarius lucerne.

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