

New herbage plant cultivars

B. Legumes

1. Clover

(d) *Trifolium subterraneum* L. var. *yannanicum* Zohary and Heller (sub clover) cv. Riverina

Reg. No. B-1d-33. Registered December 11, 1995.
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Origin

Riverina belongs to the waterlogging-tolerant variety *yannanicum* of *Trifolium subterraneum*. It is derived from the cross Meteora-Trikkala made by Dr J.S. Gladstones in 1976 at the University of Western Australia Field Station, Shenton Park, Western Australia. Initial selection within cross 76Y51 was conducted as single plants in the F₂ generation, on the basis of low formononetin content, early-midseason flowering time, good vigour and the leaf mark of its Meteora parent. Selected plants were sown as F₃ bulks in small swards at Denmark, Western Australia where they were screened for resistance to clover scorch. Resistant lines were then grown as spaced plants in the F₄ and F₅ generations. Single plant selection in both generations was

conducted on the basis of low formononetin content, good vigour, moderate levels of hard-seededness and homozygosity for leaf markings. Concurrent clover scorch screening of F₅ lines at Denmark resulted in further culling of susceptible lines.

Riverina is an F₅-derived variety, based on a bulk of four F₆ plants selected for uniformity. Its pedigree is 76Y51.16.7.5. Its name was simplified in 1983 to 76Y51.31, when it entered Stage 1 field evaluation trials in Western Australia, New South Wales, Victoria and Tasmania, as one of 81 early-midseason var. *yannanicum* breeding lines. These trials were conducted as part of the Australasian Subterranean Clover and Alternative Legumes Improvement Program (ASCALIP).

In 1989, 10 ASCALIP breeding lines were selected to enter Stage III field evaluation trials. Riverina was included in the list of the top 6 performing lines from Stage II trials in both NSW and Tasmania. Stage III field evaluation trials included 7 early-midseason var. *yannanicum* breeding lines from the South Australian Research and Development Institute, in addition to the 10 NSCIP breeding lines. These trials commenced in 1989 in New South Wales, Western Australia, South Australia and Tasmania, while Victorian trials commenced in 1990.

Field evaluation and final selection of Riverina were conducted by the following collaborators of ASCALIP: B.S. Dear and J. Dunbabin (NSW Agriculture), P.G.H. Nichols and D.A. Nicholas (Department of Agriculture Western Australia), S.G. Clark and K.F.M. Reed (Victorian Department of Agriculture), G. Mitchell and C.T. deKoning (South Australian Research and Development Institute), R.J. Orr and P.M. Evans (Tasmanian Department of Primary Industry). Phytophthora root rot screening was conducted by S.P. Flett (Victorian Department of Agriculture). Screening for disease and insect resistance was conducted by M.J. Barbetti and

D.J. Gillespie (Department of Agriculture Western Australia).

Submitted for registration by the collaborating organisations of the ASCALIP and recommended for registration by the NSW Pasture Variety Committee, Riverina is protected under the Plant Breeders Rights Act 1994 (Anon. 1995). The Department of Agriculture Western Australia will maintain breeders' seed.

Morphological description

Riverina has a central leaf mark consisting of a pale green triangular crescent, which extends from margin to margin and bears a strong resemblance to Gosse and Meteora. The leaf mark is classified as C4, using the system in Collins *et al.* (1984). Leaflets are moderately broad although not as broad as Meteora and have only a moderate indentation. They have a moderate tendency to produce an anthocyanin flush along the midrib and a weak tendency to produce anthocyanin flecking. These are particularly noticeable under cold and other growth-limiting conditions. Stipule pigmentation under closed canopies is absent to weak. Calyx tubes generally have no pigmentation. However, when exposed to light, a pale brownish-pink pigmentation can sometimes be observed along much of the calyx tube. Stems and upper surfaces of leaves are glabrous, while petioles and peduncles are glabrous to lightly pubescent.

Seedlings of Riverina are relatively large and upright. Growth habit remains typical of other var. *yanninicum* varieties in remaining relatively upright with long petioles throughout the growing season. Stems and peduncles are slender. Burr burial is moderately strong. Seed colour is cream to amber, seed size is large with approximately 86 000 seeds/kg.

Agronomic characters

Riverina is of early-midseason maturity. In Perth, flowering generally commences about one week later than Trikkala and Yarloop, one week earlier than Gosse, 3 weeks earlier than Larisa and 4 weeks earlier than Meteora. Riverina has a low level (about 0.1% of dry matter) of the oestrogenic isoflavone, formononetin, in fresh leaves. Levels for the other two, less oestrogenic, isoflavones are 1.3% for genistein and 0.4% for biochanin A.

Riverina is moderately soft-seeded and after 4 weeks in an alternating 15°C/60°C temperature cabinet it had 22% hard seed compared with Gosse with 21% and Trikkala with 8%. Riverina is moderately resistant to clover scorch (*Kabatella caulivora* [Kirchn] Karak) disease. In field screening trials at Denmark, Western Australia, Riverina was more resistant than Trikkala, but less resistant than Meteora and Gosse. Riverina has a high level of resistance to each of the 3 known distinct races of *Phytophthora clandestina* Taylor, Pascoe and Greenhalgh. This makes it unique among cultivars of var. *yanninicum*. Trikkala and Larisa are susceptible to Race 1 of *P. clandestina*, Meteora is susceptible to Race 2, Yarloop is susceptible to Race 0, while Gosse is also moderately susceptible to Race 1. In a greenhouse trial, Riverina was rated as moderately resistant to damping off by *Pythium irregulare* Buisman. This compares with Trikkala which was rated as moderately susceptible and Gosse which was highly susceptible. Riverina is highly resistant to both leaf rust (*Uromyces trifolii-repentis* Liro) and Cercospora leaf-spot (*Cercospora zebrina* Pass.) diseases (Barbetti and Nichols 1994). It is moderately susceptible to powdery mildew (*Erysiphe polygonii* DC.) being more susceptible than Trikkala, but less susceptible than Gosse.

Greenhouse studies indicate that Riverina and Trikkala seedlings have similar susceptibility to red-legged earthmite (*Halotydeus destructor* Tucker).

Growth of Riverina over the winter period in NSW was superior to Gosse and Trikkala. This was in part due to significantly higher seedling density, which was in turn related to superior seed production.

Riverina will be recommended in New South Wales, Victoria, South Australia and Western Australia for the existing Trikkala zone. Its higher levels of resistance to *P. clandestina* make it suited to waterlogged soils and irrigated pastures, while its higher levels of hard seed will make it better adapted to dryland crop rotations than Trikkala.

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References

- ANON. (1995) Subterranean Clover, *Trifolium subterraneum*, var. *yannicum*, 'Riverina'. *Plant Varieties Journal*, **8**, (3), 8.
- BARBETTI, M.J. and NICHOLS, P.G.H. (1994) Field resistance in *Trifolium subterraneum* to *Uromyces trifolii-repentis* and *Cercospora zebrina*. *Australian Journal of Experimental Agriculture*, **34**, 1136–1146.
- COLLINS, W.J., FRANCIS, C.M. and QUINLIVAN, B.J. (1984) Registered cultivars of subterranean clover — their origin, identification and potential use in Western Australia. *Bulletin No. 4083. Department of Agriculture Western Australia*. 29 pp.