

Cultivar release

‘Choice’ forage chicory (*Cichorium intybus* L.)

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Abstract ‘Choice’ forage chicory (*Cichorium intybus* L.) was bred almost entirely from ‘Grasslands Puna’ chicory, with selection emphasis on winter growth, greater uniformity and lower levels of the sesquiterpene lactones, lactucin and lactucopicrin. It is intended for use on dairy farms, where the low levels of these chemicals would be most unlikely to cause a taint or bitter aftertaste in the milk. ‘Choice’ has levels of c. 70–85% of those in ‘Puna’. Breeding took place between 1992 and 1998, and included three generations of selection for morphological features, then two generations to reduce the combined levels of lactucin and lactucopicrin. The cultivar is more uniform than ‘Puna’ in morphology and leaf shape, and is also more erect and winter-active.

Keywords ‘Choice’ forage chicory; *Cichorium intybus* L.

INTRODUCTION

When released in 1984, ‘Grasslands Puna’ was the first cultivar of chicory (*Cichorium intybus* L.) that had been bred for use as a grazing forage (Rumball 1986). Over the next few years, it was evaluated in many trials and with different classes of grazing

animal. In virtually all scenarios it was readily grazed by the animals, promoted high growth rates in them, and had no harmful side effects (Barry 1998). However, consideration was given to the slight possibility that if chicory is fed as a sole diet for several days on dairy farms, it may cause a bitterness or aftertaste in some of the milk products. It was known that chicory “bitterness” is caused by sesquiterpene lactones such as lactucin in its leaves (Price et al. 1990). Similarly, the unpleasant aftertaste is caused by the related chemical lactucopicrin. It was decided to undertake a breeding programme to reduce the combined levels of lactucin and lactucopicrin in chicory. This would be done with the knowledge that these and similar chemicals are thought to play a role in the defence of the chicory plant against insect predators (Rees & Harborne 1985). We could expect repercussions in the susceptibility to insects, diseases, and other pathogens in any new cultivar resulting from the project.

The opportunity would be taken also to make the new cultivar more uniform than ‘Puna’, as this original “concept” cultivar was still variable in morphology, shape of leaf margin, date of heading, and leaf colour.

ORIGIN

In April 1992, over 2000 plants of ‘Puna’ were grown in a field at Palmerston North, New Zealand. During the next 8 months they were scored for vigour (especially in the cool season), morphology and flowering time, leaf colour and shape of leaf margin. In December, 140 plants that were vigorous, dense and bushy; that had leaves with a smooth entire margin, but lacked red patches or red veins; and that commenced flowering at the same time were removed to an isolation house for inter-pollination. The harvested seed was used the following year to provide another selection pool of 1600 plants, along with some plants of ‘Puna’ as a control. The process of data collection was repeated until September 1993, when 32 plants were selected,

cloned six times each, and transferred to an isolation house for polycrossing. They were rogued for uniformity at flowering time, then interpollinated. The bulked seed was germinated to give 1600 plants for a third generation of selection during 1994, along with 'Puna' and two other populations.

On 30 November 1994, 1000 of the most productive and uniform plants had their above-ground bulk separately harvested and frozen, then freeze-dried and fine-ground. They were each measured for lactucin and lactucopicrin content in an ELISA assay supplied by the Agrotechnological Institute at Wageningen, Netherlands. From the data obtained, 79 plants with the lowest combined concentrations of lactucin and lactucopicrin were removed and isolated for interpollination. The seed was harvested in separate progenies in 1996 and grown to provide c. 400 plants of the next generation to be screened for combined lactucin/lactucopicrin levels. The lowest 101 were reduced to 41 on uniformity criteria, and were then interpollinated, to provide seed of the provisional "low-lactucin" selection. This was re-selected for distinctiveness and uniformity during 1997, and a final isolation was carried out over the summer of 1997–98, to provide nucleus seed of the selection. It was sent to AgResearch, Lincoln for seed increase and commercialisation.

The selection was named 'Choice'. New Zealand Plant Variety Rights were granted to the new cultivar on 15 July 2002.

DESCRIPTION

'Choice' is an erect cultivar with smooth leaves having little margin undulation, serration or surface blistering. It has smoother leaves than either 'Grasslands Puna' or the recently-released 'Puna II' (Rumball et al. 2003). Anthocyanin colouring, where present, is produced at only very low levels in ribs or leaf surface, lower than in either 'Puna' or 'Puna II'. It produces much more winter forage than 'Puna', which is almost dormant in winter, and c. 30% more than 'Puna II', but shows a lower tolerance to *Sclerotinia* than either of these in inoculation studies. The detailed data are obtainable from the Plant Variety Rights (PVR) application.

The level of lactucin + lactucopicrin varies considerably between and within chicory plants, and through seasons of the year. However, a series of eight comparative harvests over 13 months showed 'Choice' to have lower levels than 'Puna' on all but

one occasion, and to average 72% of 'Puna' over the period (R. G. Keogh unpubl. data). Data from the PVR trial showed 'Choice' to have an average lactucin/lactucopicrin value 85% of that in 'Puna'.

USE AND PERFORMANCE

'Choice' chicory would be extremely unlikely to cause problems of milk taint on dairy farms, under the recommended grazing routine of a 2–3 h feeding break for cows each day on pure swards. This routine has never given problems with 'Puna', and 'Choice' has even lower levels of lactucin/lactucopicrin. Also, being more winter-active, 'Choice' will give a greater seasonal spread of growth. However, it is likely to be less persistent than 'Puna' in mixed or pure pastures. This has been indicated at various stages of the breeding programme, when individual plants from the population leading to 'Choice' have died in swards in greater frequency than those of 'Puna' or of other selection lines with higher levels of lactucin/lactucopicrin. In one trial at Palmerston North where chicory was planted into a grass sward, 60% of 'Puna' plants had survived after 2 years, but only 11% of 'Choice'. It is, of course, not certain why more 'Choice' plants died, but it was not unexpected, given the earlier evidence (Rees & Harborne 1985) that sesquiterpene lactones have a role in the chemical defence of the chicory plant. From both this theoretical and observed evidence of an unwanted side effect, it was decided not to proceed beyond two generations of selection for low lactucin/lactucopicrin in the breeding programme. If 'Choice' proves to have low persistence in mixed pastures, it should probably be used as a specialist pure crop.

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