

VARIATION IN ST. JOHN'S WORT, *HYPERICUM PERFORATUM* L., IN N.S.W.

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*Summary.* Morphological differences have been observed between specimens of St. John's wort, *Hypericum perforatum*, collected from different locations in N.S.W. and grown in a common environment at Bathurst. It appears likely that the broad-leaved var. *perforatum* from northern Europe is here as well as the narrow-leaved var. *angustifolium*. There are differences between narrow-leaved forms that indicate the presence of other varieties, ecotypes or hybrids. Efforts are being made to distinguish between varieties using morphology, cytology, electrophoresis and chemical analysis.

## INTRODUCTION

Specimens of St. John's wort collected in 1929 in N.S.W., Victoria and S.A., as well as samples fed to sheep (7), were classed as var. *angustifolium* de Candolle (1,2) at the Royal Botanic Gardens, Kew (B. Mathew, pers. comm., 1983). As a result it was accepted that the narrow-leaved variety was the only one in Australia. However, more recently, differences noted between plants of St. John's wort suggest that more than one variety is present.

In Europe varieties of *H. perforatum* have broad leaves (var. *perforatum*, northern Europe - U.K.), narrow leaves (var. *angustifolium*, southern Europe - Spain), intermediate leaves (hybrids?), or small leaves (var. *microphyllum*) (5,6). To investigate whether these varieties occur in N.S.W., specimens were collected from various locations, grown in a common environment at Bathurst, and observed over time.

## METHODS

Plants were raised from seeds collected at Orange (Duntry League, Bloomfield short), Captains Flat, Adelong, Mudgee (short and tall) and Tuena, N.S.W. Captains Flat and Coolah are 500 km apart; other locations are between these two. Observations were made on morphological differences that might indicate that different varieties or ecotypes exist in N.S.W.

## RESULTS AND DISCUSSION

*Morphology.* Observations made between 1985 and 1987 revealed the existence of two groups of plants: the broad-leaved variety (Duntry League, Bloomfield short) characterised by broad leaves, early flowering, shortness, thick stems and large capsules; and the narrow-leaved variety (Captains Flat, Adelong, Mudgee short and tall, Tuena) characterised by narrow leaves, late flowering, tallness, thin stems and small capsules (Table 1).

Table 1. Characteristics of St John's wort from different locations in N.S.W. The first 3 characteristics were meaned for December 1985 and 1986; the latter 2 were measured in December 1985 only.

Collection site	Leaves <sup>a</sup>			Flower- ing in early Dec. (%)	Height at full flower (cm)	Stem diam. <sup>b</sup> (mm)	Capsule size (mm)
	Width (mm)	Length (mm)	Length: width ratio				
Duntry League	12.6	23.8	2:1	85	57	6.2	8.0 x 2.1
Bloomfield (short)	11.8	22.8	2:1	85	61	5.6	7.5 x 2.0
Captains Flat	9.3	28.0	3:1	50	86	4.9	6.7 x 1.9
Adelong	9.2	29.4	3:1	33	77	4.7	5.6 x 1.8
Mudgee (short)	9.1	26.4	3:1	78	69	4.2	6.3 x 1.8
Mudgee (tall)	8.8	31.6	4:1	18	90	4.4	7.2 x 1.8
Tuena	8.1	27.5	3:1	13	77	4.2	7.0 x 2.0
c.v.	5.0	7.2					

<sup>a</sup>From central 6 nodes on main flowering stem.

<sup>b</sup>Just below the 6 central nodes.

Broad leaves were 10 to 14 mm in width and narrow leaves 7 to 10 mm. The leaves measured were from the central six nodes on the main flowering stem because the c.v. of their measurement was lower (6.1%) than that of leaves from the central 10 nodes on the main stem (8.4%), or that of the third leaf on branches off the main stem (9.4% for 6 and 11.7% for 10 leaves).

Leaf measurements are not made in Europe, the distinction between varieties being based on leaf ratios (length:width), broad being 2:1 and narrow up to 6:1 (N.K.B. Robson, pers. comm., 1986), which confirms the classification of groups made above.

Based on the characters in Table 1 there were no consistent groups in the narrow-leaved 'varieties', however, some other characters may help distinguish between them. For example, the following parts of Mudgee tall, were strongly maroon coloured: young buds (giving them an orange appearance); the top branches bearing buds; sepals enclosing the bud; and non-flowering stems. The only other 'varieties' that had a strong maroon colour were Adelong (top branches, non-flowering stems) and Tuena (sepals).

Other characters that may be used to assess differences between varieties include colour of foliage and flowering stem. For example, Bloomfield short had dark green foliage and a light green flowering stem, whereas Bloomfield tall (found growing in the same paddock), apart from being 20 cm taller, had light green foliage and a bright pink flowering stem. Efforts to attribute a typical colour to foliage and stem of a certain variety is fraught with danger as the colours change as the plants mature. Although flower size has been used as a distinguishing character overseas (large flowers in var. *perforatum* and "sometimes smaller flowers" in var. *angustifolium*) (5), it has not been useful here.

Repeatability of differences in morphology. Measurements of leaves, flowering and height made in 1985 and 1986 showed fair repeatability (Table 2). Variation between years could have been influenced by sampling, seasonal

conditions, or by 1985 plants being immature.

Table 2. Plant characteristics (measured on December 5 in 1985 and 1986) of 'varieties' of St John's wort, grown at Bathurst.

Collection site	Leaf widthxlength		Flowers open		Height	
	1985	1986	1985	1986	1985	1986
	(mm)		(%)		(cm)	
Duntry League	12.3x24.3	12.9x23.4	70	99	56	59
Bloomfield (short)	11.2x21.7	12.3x23.9	75	95	61	62
Captains Flat	7.8x26.5	10.8x29.5	40	60	91	81
Adelong	9.2x29.5	9.3x29.3	25	40	83	72
Mudgee (short)	9.0x27.3	9.3x25.6	75	80	65	73
Mudgee (tall)	8.1x31.0	9.6x32.2	10	25	83	97
Tuena	7.1x27.7	9.2x27.3	20	5	83	72

Non-morphological characteristics. The cytology, electrophoresis and chemical composition of plants from different locations is being investigated. In Europe the narrow-leaved varieties differ genetically from the wide-leaved ones (6). Thus attempts are being made to count chromosomes in the different N.S.W. 'varieties'.

Electrophoresis has been used successfully to distinguish between three forms of skeleton weed, *Chondrilla jucea*, with narrow, broad and intermediate leaves, that could not be distinguished reliably by morphological characters (4). However, gel electrophoresis at pH 3 was not useful in distinguishing between two varieties of St. John's wort although small differences were found when a mercapto ethanol treatment was applied. Further testing is under way using other electrophoresis techniques.

Attempts are being made to determine the level of hypericin in different 'varieties' but as yet an analytical technique has not been perfected.

Germination. Large differences were found in the germination capacity of seeds of plants collected from 5 locations (Table 3). Whether the different germination capacities were due to 'variety' or ripening conditions in the different localities has not been ascertained.

Table 3. Germination (%) of seeds of St. John's wort collected in 1984.

Collection site	Month collected	Germination after 41 days <sup>a</sup>	
		In light	In dark
Tuena	April	81 a	4 d
Coolah	April	49 b	3 d
Mudgee (short)	January	46 b	1 d
Captains Flat	May	17 c	0
Duntry League	May	12 c	0

<sup>a</sup> Values followed by the same letter are not significantly different (P = 0.05).

Consequences. If there are a number of 'varieties' in N.S.W. it could mean different levels of toxicity to animals and differences in susceptibility to herbicides, or biological control agents.

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