NOTES AND COMMENTS

ON THE POLYMORPHISM OF CYANOGENESIS IN *LOTUS CORNICULATUS* L.

II. THE INTERACTION WITH *TRIFOLIUM REPENS* L.

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Populations of *Lotus corniculatus* and *Trifolium repens* often contain both cyanogenic and acyanogenic plants (Dawson, 1941; Daday, 1954). The selective eating of the acyanogenic form of *L. corniculatus* by various animals (Jones, 1966) and the greater fitness of the cyanogenic form at higher winter mean temperature in *T. repens* (Daday, 1965) appear to be antagonistic selective forces acting on the polymorphism of cyanogenesis. But in England it is difficult, if not impossible, to find populations of *L. corniculatus* which do not contain *T. repens* and any results obtained for the former species may well be confounded because of the presence of the latter species. Fortunately populations of *T. repens* without *L. corniculatus* are common and it is possible, therefore, to study the interaction between the polymorphism in mixed populations of the two species using pure populations of *T. repens* as a reference control. This approach has shown that there is indeed an interaction.

1. Methods and results

The methods used to test the plants for cyanogenesis have been described previously (Jones, 1966). The eight populations listed in table 1 were chosen because of their relatively large size and their relation to groups of *T. repens* plants growing near by. Table 1 shows that in all the mixed populations the frequency of cyanogenic plants amongst *T. repens* is significantly lower than that amongst *L. corniculatus*. The χ^2_1 values for the 2×2 contingency tables are given in table 2.

When the frequency of cyanogenic *T. repens* in mixed populations is compared with that in non mixed populations one of three situations may occur. In populations 1 to 4 the frequency in mixed populations is significantly lower than in non mixed. In populations 5 and 6 there is no significant difference but the trend is the same. The trend is reversed in populations 7 and 8, there also being no significant difference between the frequencies.

Interpretation

Before attempting to explain these results it should be noted that care must be exercised when studying *T. repens* in the British Isles. This is because the species is used as a fodder and ley crop and several of the most widely used agronomic strains contain a high frequency of cyanogenic plants. It is often difficult to assess the genetic contamination of the wild populations. The habitats chosen were adjacent to permanent pasture rather than arable land.

The distance betwen the two groups of *T. repens* plants was less than 25 metres in all eight habitats. The habitats are also linear and it is therefore unlikely that temperature is responsible for the results observed in the first four populations. It is intended that temperature should be measured in these and other habitats.

TABLE 1

Populations of Trifolium repens *and* Lotus corniculatus *tested for the* cyanogenic phenotype

	Mixed populations				Pure populations of *Trifolium repens*	
	Lotus corniculatus		*Trifolium repens*			
Location	N	Per cent. cyanogenic plants	N	Per cent. cyanogenic plants	N	Per cent. cyanogenic plants
1. Clent	154	87·6	22	36·4	73	80·8
2. Wawensmoor	87	80·5	47	19·1	50	42·0
3. Malvern	120	70·8	44	34·0	50	92·0
4. North Oxford	34	100·0	29	41·4	24	87·5
5. Walsall	68	98·5	50	42·0	50	58·0
6. Rubery, Old Station	148	77·0	95	33·6	25	44·0
7. Dunton Wharf	52	98·1	45	31·1	50	26·0
8. Hampton in Arden	80	98·7	70	38·5	49	26·5

TABLE 2

Values of χ^2 for 2 × 2 contingency tables of the raw data used to construct table 1

Location	Mixed populations *L. corniculatus* × *T. repens*		*T. repens* in mixed populations × *T. repens* in pure populations	
1	33·25	***	16·07	***
2	47·40	***	5·92	*
3	18·26	***	34·45	***
4	27·30	***	11·89	***
5	48·56	***	2·56	N.S.
6	45·32	***	0·92	N.S.
7	48·94	***	0·30	N.S.
8	65·22	***	1·87	N.S.

N.S. Not significant.
* $0·05 > P > 0·01$. ** $0·01 > P > 0·001$. *** $P < 0·001$.

There is a remote possibility that the factors limiting the distribution of *L. corniculatus* in the first four populations are the same as those determining the high frequency of cyanogenic *T. repens* in non-mixed populations. There is no evidence either way.

The habitats of populations 1, 5, 6 and 7 have been in existence in their present form for from two to five years. The others are much older. It is likely that populations 2, 3, 4 and 8 approximate more nearly to an equilibrium stage—if such a balance can exist.

With the North Oxford populations two samples of *T. repens* were made.

The first was adjacent to the mixed population while the second was further away. The results in table 3 indicate a cline. Perhaps the groups of *T. repens* plants sampled in habitats 5 to 8 were too near to the mixed populations to show the fall in the frequency of acyanogenic plants found in habitats 1 to 4.

TABLE 3

Frequency of the cyanogenic form of T. repens *in three adjacent groups of plants in North Oxford*

Locality	Per cent. cyanogenic plants
Mixed population	41·4
Near the mixed population	52·0
Further away from the mixed population	87·5

It is apparent that there is an interaction between the polymorphism of cyanogenesis in *Lotus corniculatus* and *Trifolium repens* and further studies are in progress to determine the factors affecting the polymorphism.

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2. REFERENCES

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