

## RIGHT-LEFT SYMMETRY IN SHOOT AND FLOWERS OF TRIBULUS CISSOIDES

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### Abstract

*Tribulus Cissoides* has oppositely placed large and small paripinnate compound leaves at the nodes alternating between right and left hand sides. The flowers arising at the axils of small leaves have clockwise (right-handed) or anticlockwise (left-handed) imbricated petals depending on whether they are on the right or the left hand sides of the stem. Thus geometrically, the structure at each node is the mirror image of the one above or below. It is found that the flower differentiation process favours 'left handedness,' for about 53% of the flowers originate in the left-handed leaf axils and approximately the same percentage of secondary shoots originate in the right-handed leaf axils.

### INTRODUCTION

The relationship between symmetry of the plant shoot and the flower has attracted the attention of several workers (Eichler, 1875; Lyndon, 1979; Matzke, 1929; Sinnott, 1960). Recently we have discussed how the handedness of spiral phyllotaxis in the shoot of *Hibiscus furcatus* L., is correlated to the sense of imbrication of the flower (Tennakone, Dayatilaka and Ariyaratne, 1982). In this note we describe our observations on a even more peculiar way in which the right-left symmetry of the shoot of *Tribulus Cissoides* L is related to that of the flower.

### OBSERVATIONS AND DISCUSSION

*Tribulus Cissoides* (vegetatively propagated ornamental plant widely distributed in the tropics and the subtropics) has oppositely placed two paripinnate compound leaves. The characteristic feature is that one of the leaves at each node is smaller than the other and small leaves alternate between right and left hand sides (Fig. 1). If we cut the stem into pieces including one node, the resulting consecutive segments (Fig. 2) are mirror images of each other (since dorsal and ventral sides of the leaves are different and they lie in the same plane with the stem, two such segments cannot be made to look similar

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Key words : *Tribulus Cissoides* L., phyllotaxy, imbrication of flowers.

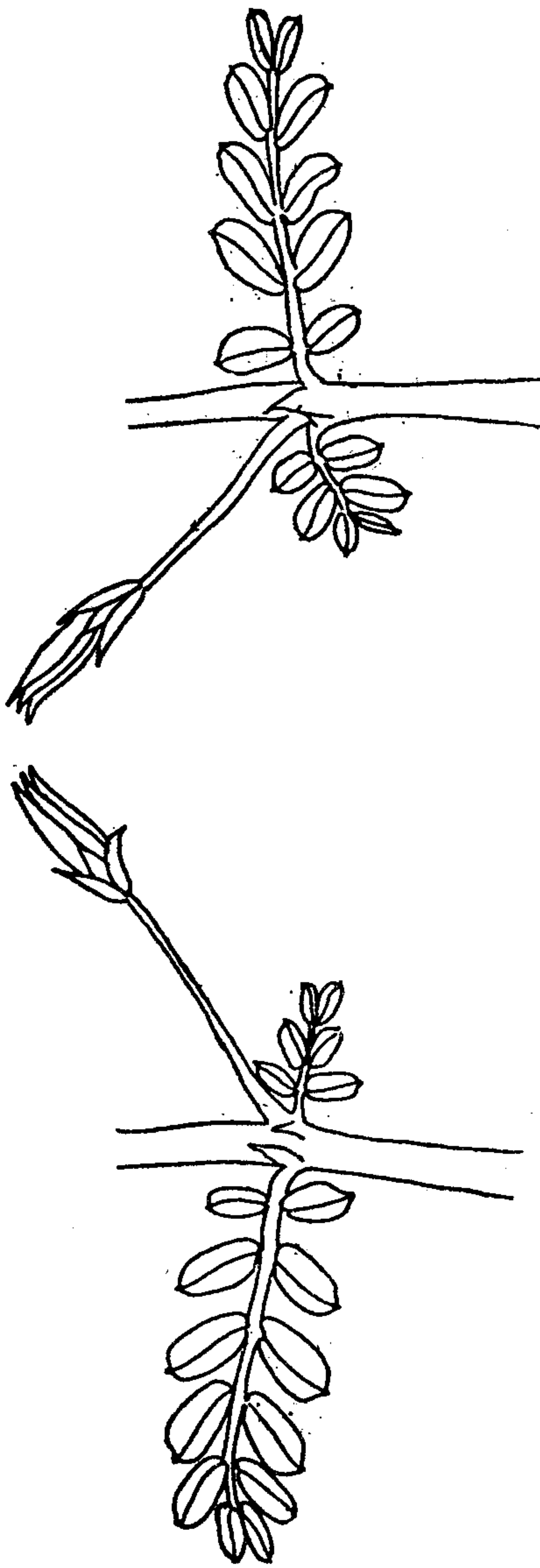


Fig. 1

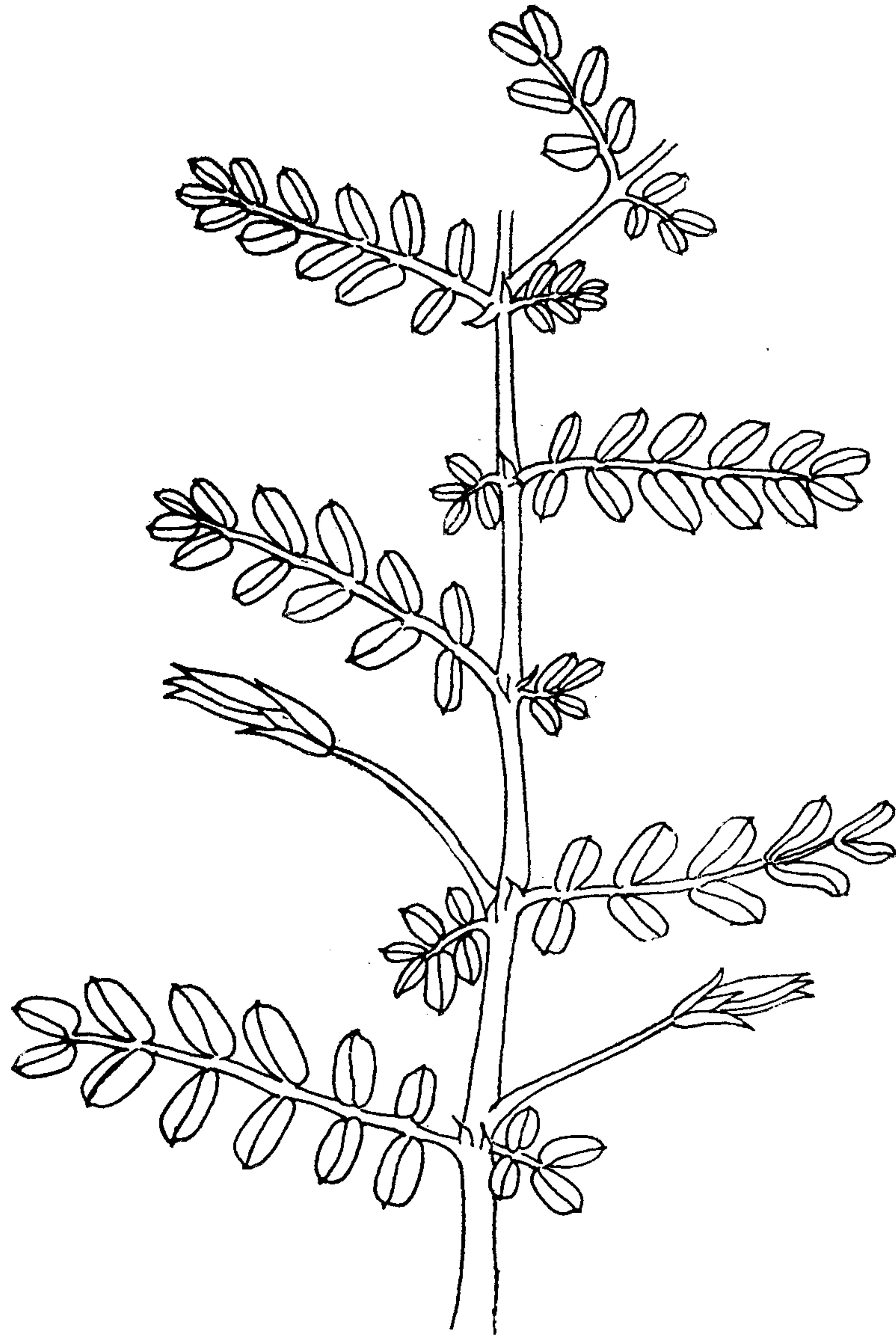


Fig. 2

| <i>Plant</i> | <i>R</i> | <i>L</i> | <i>L%</i> |
|--------------|----------|----------|-----------|
| 1.           | 1402     | 1578     | 53.0      |
| 2.           | 916      | 1008     | 52.6      |
| 3.           | 1248     | 1399     | 52.6      |
| 4.           | 701      | 788      | 52.9      |

Table 1

## Figure and Table Caption

- Fig. 1. A branch of *Tribulus Cissoides* showing clockwise imbricated flowers on right—hand side and anticlockwise imbricated flowers on left-hand side.
- Fig. 2. Two consecutive segments from a branch of *Tribulus Cissoides* including one node.
- Table. 1. The yield of right and left handed flowers from 4 *Tribulus Cissoides* plants in one year.

by a rotation). The flowers and lateral branches always arise in the axil near the small leaf. As the flowers are imbricated they define a right or left handedness and it is found that the axils in small leaves on the right hand side of the stem always yield right-handed flowers and those on the left hand side yield only left-handed flowers (The convention we have used for assigning a handedness to flowers is the following: An imbricated flower is right or left handed according to whether the twisting of the petals is clockwise or anticlockwise). Thus the consecutive nodes are mirror images of each other with respect to flowers as well (Fig. 2), and this symmetry is never violated.

To see whether both types of flowers are produced with equal probabilities, we examined the daily yield of flowers from 4 plants for a period of one year. The results are presented in Table 1. It is seen that there is a tendency for the left-handed small left axils to yield flowers at a slightly higher probability ( $\sim 53\%$ ). When we examined the lateral branches the reverse is found to be true, about 53% of the lateral shoots are developed in leaf axils of the small leaves towards right-hand side. The approximate equility of these two percentages is an indication that the secondary shoots initiated in small leaf axils on the left differentiates into flowers with a slightly higher probability.

There is no evidence that environmental and other external factors have any influence on the this slight right-left asymmetry seen in *Tribulus Cissoides*. However, at this stage it is difficult to explain how the asymmetry is inherited. Possibly, it originates from a right-left difference at the molecular or cellular level.

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