The Floral and Seed Structure of a poisonous species of *Lotus* from Australia

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Lotus cruentus Court, the red-flowered trefoil, is one of two indigenous species of *Lotus* in Australia. It is a decumbent or ascending perennial herb found in all mainland states in a diverse range of soil types and plant communities, varying from flood and sand plains to rocky hillsides (Cunningham, Mulham, Milthorpe and Leigh, 1981).

The leaves consist of five narrow obovate to broadly cuneate leaflets. The flowers are red, pink or white, 6-8mm long and are borne in leaf axils in groups of 1-3 (Norris and Harden, 1991).The calyx lobes are acute, almost equal, and with long silky hairs (Fig 1A). Unlike in many other papilionoid genera, the wing petals have no sculpturing but have a distinct pocket in the upper basal region. The pod is brown, hairless and curves upwards (Fig 1A).

Red-flowered trefoil is known to cause poisoning in livestock, mainly in sheep, during drought (McBarron, 1978). The toxic chemical is HCN which is prevalent in young green leaves (Everist, 1974). The toxicity is still high even at the podded stage (McBarron, 1978).

The stigma of *L. cruentus* consists of short, densely-packed papillae (Fig. 1B). The surfaces of the papillae are coated giving a convoluted, furry appearance. The coating is no doubt very important for the recognition and stimulation of pollen to germinate.

The pollen grain (Fig. 1C) is slightly oblong to spheroidal in shape and shows three furrows (colpi) that are fairly narrow with undifferentiated margins. The surface (exine) is generally smooth with a scattering of fine perforations. The aperture of the pollen is quite distinct. These features

appear to be common to other species of the genus (Ferguson and Skvarla, 1981).

The ovule (Fig. 2A) has two coverings (called integuments) which are continuous except at the tip where a zig-zag micropyle allows access for the pollen tube to enter. An unusual feature of the inner integument is the presence of an endothelium which nourishes the embryo sac. Another unusual feature of the ovule is the presence of large, glandular cells on the placenta in the region of the funicle constituting an obturator that assists the pollen tube in its growth towards the ovule. Following a developmental pattern common to most angiosperms (Polygonum type), a female gametophyte (also called an embryo sac) containg eight nuclei organised into seven cells is formed inside the ovule.

Upon fertilisation, an embryo is formed. Figure 2B shows longitudinal section through an immature seed. Part of the nourishing tissue (the endosperm) has solidified along the periphery while the bulk of the endosperm remains liquid with a large number of free nuclei.

Cellular details of the seed coat (testa) are shown in Figure 3C. The characteristic macrosclereid (or malpighian) layer is prominent on the outside with a layer of osteosclereids lying underneath. Starch grains are abundant in the seed coat.

References

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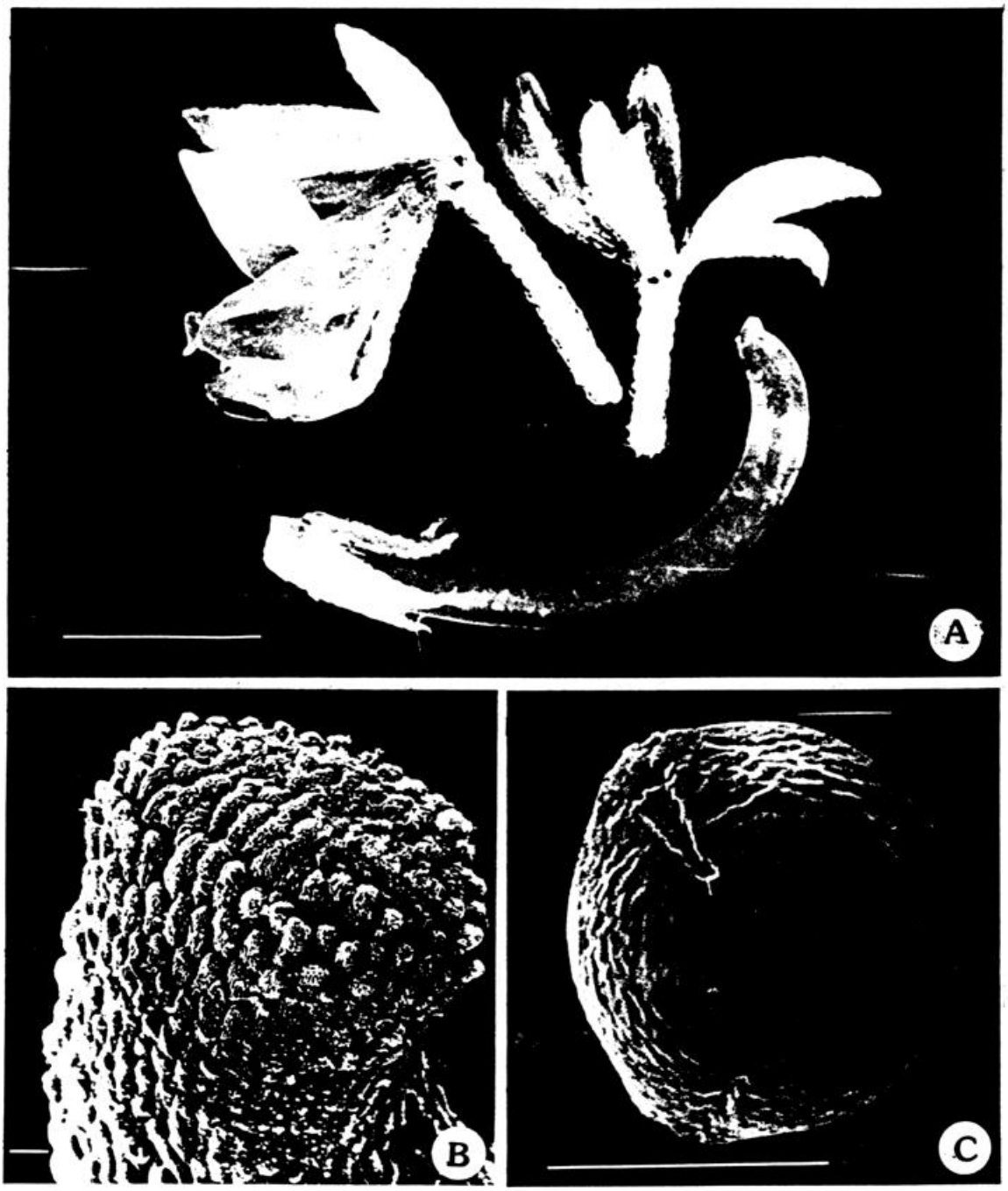
Figure Legends

Figure **1.** *Lotus cruentus*. **A**. Bud, flower and fruit. Bar = 1cm.
B. S.E.M. of the stigmatic surface showing short, densely packed rough papillae. Bar = 10mm. **C.** S.E.M. of a pollen grain showing 3 colpi and a fairly smooth, slightly perforate surface. Bar = 10mm.

Figure **2.** *Lotus cruentus*.. **A**. L.s. ovule showing obturator cells (*ob*) at the base of the funicle (*fu*), outer integument (*oi*), inner integument (*ii*) with a well-developed endothelium (*et*) and enclosing a zig-zag micropyle (*mi*). The mature embryo sac (*es*) consists of an egg cell (*eg*) flanked by 2 synergid cells (*sy*), 2 polar nuclei (*pn*) in a central cell and 3 antipodal cells (*an*). Bar = 20mm.
B. L.s. of an immature seed showing young embryo (*em*), solid and liquid endosperm (*en*) and a layer of macrosclereids (*ms*) in the testa. Bar = 5mm.
C. T.s. of seed coat showing macrosclereid (or malpighian) layer (*ms*), the osteosclereid layer (*os*) containing starch (*st*) and the solid endosperm (*en*) lying underneath. Bar = 50mm.


A
B
C

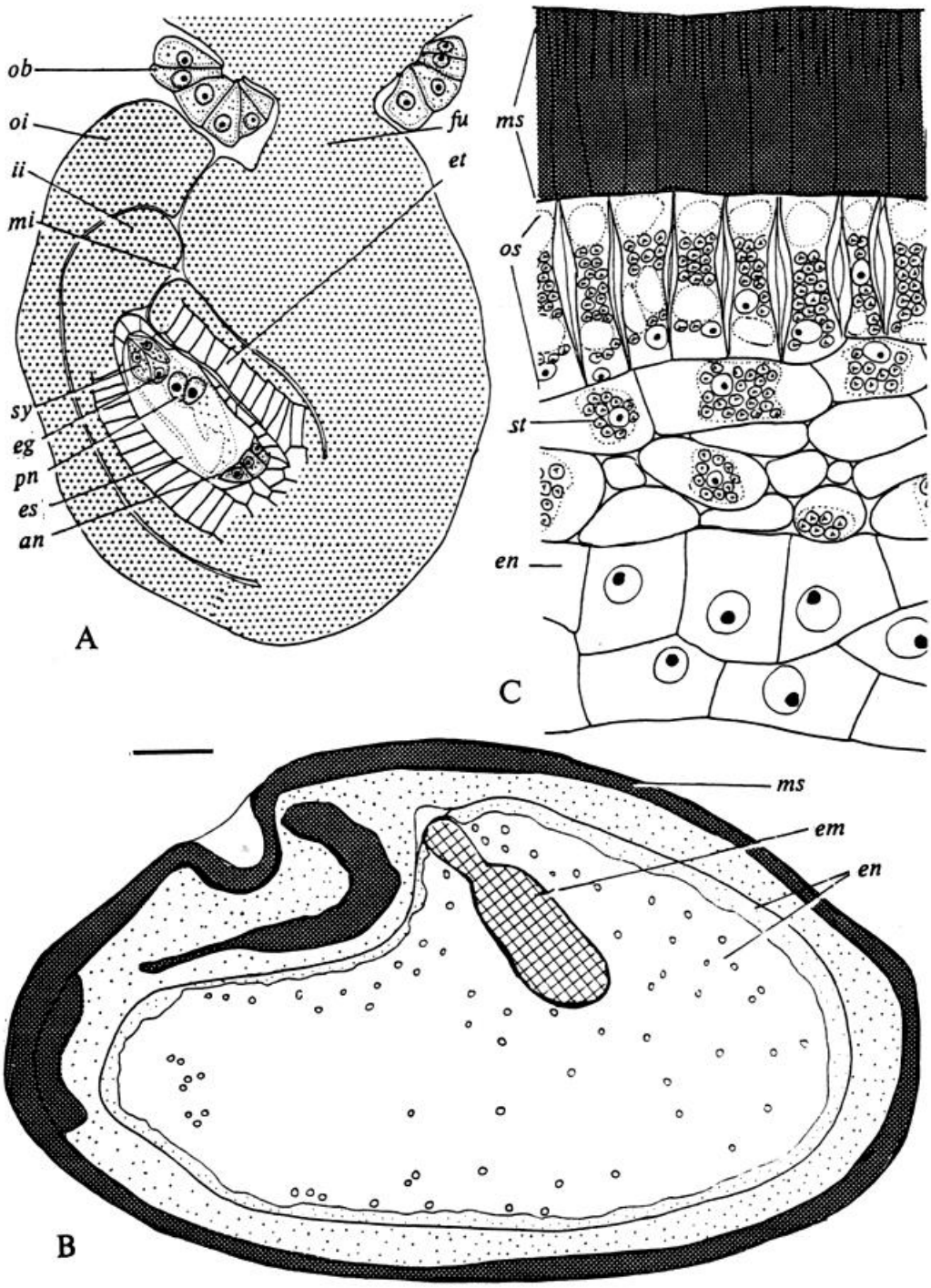


FIGURE 2