Cactus Alkaloids and Biochemical Aids to Taxonomy

by Paul Launchbury

The issue of the Nat. Cact & Succ. J., 34/1, 1979, carried two papers which reflect (to my way of thinking at least) two facets of the same theme. I refer to "Hallucinogenic Cacti" by Dr Philip Evans on pages 14-16 and "Cactus Evolution—A Biochemical Alternative" by Richard Brown. Having been interested in psychopharmacology and botany for more than 25 years, and being professionally well-placed to follow the literature, I have built up a library of 126 of the more important papers covering both fields. These indicate that hallucinogenic alkaloids are even more widely spread through the *Cactaceae* than might be apparent from Dr Evans' paper and potentially hallucinogenic compounds even more so.

I would not like it to be thought, and still less widely reported, that nearly every cactus contains a potentially psycho-active compound; it would be tragic if we found ourselves in the position of the Mycological Society whose members are in danger of prosecution for the possession of many of their specimens on the grounds that they contain controlled hallucinogens. At the moment the law permits us to possess mescaline in the form of living plants of *Lophophora williamsii*, but one has only to recall the furore raised by vote-seeking politicians in the early to mid 1960's over species of *Ipomoea* to realise how real is the danger of U.S.A.-type restrictive legislation being clamped on us if we make too much of this aspect. Indeed, I suggest it would be wrong to do so, for even a cursory glance through the papers listed in my bibliography illustrates that the alkaloids of the *Cactaceae* with hallucinogenic properties are only one extreme example of a small group of central nervous system stimulants found in many other plant families, as well as the *Cactaceae*.

Many of the phenylethylamines found in cacti appear on animal screening to be more active on the cardiovascular system than the nervous system, though admittedly the distinction is not always easy to make. Further, taking the consideration of the alkaloids active on the mind a stage further, the tetrahydroisoquinolines have a multitude of potential activities, including that of being anti-depressant (it is no accident that one of the newer effective anti-depressants, nomifensine, is a simple derivative of a cactus alkaloid of this group). The other properties which can be discerned in cactus alkaloids include antimicrobial, antihypertensive and, very probably, anti-cancer activities, to name only a few. It must be rare to have such a range of activity and such diversities of structures in one plant family. I hope that these very brief observations will at least do something to give balance to the picture of cactus alkaloids as presented in Dr Evans' paper.

Turning now to Richard Brown's biochemical approach to relationships in *Cactaceae*, it is indeed true that this method of taxonomic study is still in its infancy, and the reason is that the techniques have only recently been adequately developed for its application, and even now many research departments are not capable of the kind of studies he mentions. However, it has to be remembered that many of the proteins transcribed from the DNA he mentions are enzymes or components of multi-enzyme systems. A few of these systems have as their end-products the alkaloids to which we have briefly referred above. The importance of this is that it is much easier to identify alkaloids and characterise them chemically, than it is to do the same for proteins, and I would suggest that Brown's method could be given a first application by a detailed analysis of the alkaloid patterns of the *Cactaceae* and related families (references appropriate to this theme are scattered through the 126 titles referred to above). Just to quote one example, the identification of a histamine-like alkaloid (containing an imidazole instead of a phenyl ring) in *Dolichothele* raises obvious questions as to the relationship of these plants to *Mammillaria*, while the occurrence of bis-benzylisoquinoline dimeric alkaloids in certain cerei and in, for example, *Thalictrum*, calls for consideration to be given to the connections between cacti and these latter plants. This approach has its dangers though, and is full of traps for the unwary—hordenine for example, has been isolated from algae as well as many cacti!

In summary, I think it is a pity that very few who study cacti give attention to the biochemical and pharmacological properties of these plants, let alone use this information as part of the investigative machinery of taxonomy. Perhaps at last things are taking a turn for the better.

Cacti and Succulents on Stamps (contd.)

Neighbouring **South Africa** issued an interesting set of four on 21-8-78, illustrating landscape paintings by the artist Volschenk. The 10c and 25c values show flowering Aloes which I understand are most probably *Aloe ferox*. A miniature sheet also goes with this series.

Finally, two countries in the Middle East have something to offer us. **Qatar** issued a wildlife set of six on 14-4-71. The 2D value, SG350, shows a lizard posing against an Opuntia background. From **Syria** we have a strip of five different cacti commemorating the International Flower Show held in Damascus during 1978. My identification of the plants portrayed are: 25P Rebutia, 30P Chamaecereus, 35P Opuntia, 50P Coryphantha and 60P Gymnocalycium, but I could be wrong!