IX. SPECIFIC THERAPEUTIC EFFECTS OF THE SPECIES IN THE DATABASE

Plant species included in the formulations of Indian medicine have been chosen for their specific therapeutic effects. While a few species are exclusive in their action, the rest have several simultaneous effects. The various therapeutic effects of the 127 species in the database are summarised in Table 5. The species important in different contexts of the gastrointestinal disorders are discussed here.

a. Antimicrobial Effects

There are 28 species with antibacterial effects in the database. Eight species are with antiviral effects, while six are antifungal. No single species is known exclusively for an antimicrobial effect (Table 5) they also have some other therapeutic effects in addition.

b. Analgesics

Piper longum, Syzygium aromaticum and Tinospora cordifolia are the only species with analgesic effects though this is not their only action (Table 5). No wonder that cloves or clove oil are widely used to alleviate pain due to carious teeth.

c. Emetics and Purgatives

Cases of poisoning or some other problem may necessitate clearing the stomach and the intestines of the
offending substance through the use of emetics and purgatives.

In this database there are 10 species with emetic action and 41 with purgative action (Table 5). There is no species which acts solely as an emetic while only *Vigna unguiculata*, *Marsdenia tenacissima* and *Ficus carica* function exclusively as purgatives.

Among the plants with emetic activity, *Holarrhena antidysenterica*, *Manilkara hexandra*, *Tinospora cordifolia* and *Calotropis procera* function as emetics and not as a purgatives; these species may have some other therapeutic action (Table 5). A number of species act as purgatives and may have some therapeutic action other than emetic (Table 5).

*Calotropis gigantea*, *Cardiospermum halicacabum*, *Crotalaria juncea*, *Foeniculum vulgare*, *Moringa oleifera* and *Boerhavia diffusa* can function as both emetics and purgatives (Table 5).

Drugs with emetic and purgative effects function in several different ways basing on which they are classified into different groups. Table 6 summarises the mechanism of action of 90 species used as emetics and purgatives in Indian medicine. Among these, 32 species are in the present database (Table 6).
In the case of 42 species, the mechanism of emetic action is unknown. Fifty four of these 61 species function exclusively as emetics. *Acorus calamus*, *Cissampelos pareira* and *Saccharum officinarum* stimulate the chemoreceptor trigger zone; four species act peripherally and twelve act at both the sites (Table 6).

Thirty six species in Table 6 are known to act as purgatives. For 10 species the mechanism of action is unknown. Only *Punica granatum* functions as a bulk laxative while *Vitis vinifera* acts as a faecal softener. The mode of action of *Ficus carica* and *Vigna unguiculata*, species with exclusive purgative effects, is unknown. The majority of the species (23) function as stimulant purgatives. Eight species are anthraquinone derivative purgatives while *Ricinus communis* is the only irritant oil group purgative, which is the strongest of all.

While members of the Cucurbitaceae seem to be effective emetics, the Euphorbiaceae seem to be the family of effective purgatives.

d. Antiemetics and Antipurgatives

Antiemetics and antipurgatives are useful in stopping vomiting and purgation. Vomiting and purgation are in fact mechanisms by which the body gets rid of the offending material in the stomach or the intestines. However, the
physical and psychological disturbance caused by emesis and purgation is sought to be alleviated through medication.

Thirty one species in the database have antiemetic effects while 64 have antipurgative action (Table 5). This is a wide choice. Since indigenous medication rarely involves a single species, a formulation is likely to contain several species with antiemetic and/or antipurgative effects.

The effect of *Combretum micranthum* is antiemetic besides being antibacterial. No other therapeutic effect is found in this species. Similarly *Schoenoplectus articulatus* is antiemetic besides being an antipurgative.

A drug may act as an antiemetic or antipurgative depending on the site of the trouble. Many antiemetic plants in the database have several therapeutic effects but not antipurgative.

The exceptions to this are *Schoenoplectus articulatus* and *Schoenoplectus grossus* which are exclusively antiemetic and antipurgative. These two species should be considered exclusively for this effect.

e. Antiflatulants and Carminatives

These are meant to relieve gastrointestinal distension with gas and the associated colic (pain). There are 16
species in the database with antiflatulant effect and 43 with carminative effects (Table 5). No single species has these effects exclusively. \textit{Angelica glauca} is a carminative, which is also a stimulant and so is particularly suitable for alleviating gastrointestinal discomfort.

Most of the orally administered antiflatulants are carminatives which contain aromatic oils. Several members of the Apiaceae, \textit{Cinnamomum zeylanicum}, \textit{Syzygium aromaticum}, \textit{Zingiber officinale}, \textit{Myristica fragrans}, \textit{Piper nigrum}, etc., are routinely used with good effect. Besides these, a number of other species, which do not contain aromatic oils also function as antiflatulants and carminatives, possibly by improving gastrointestinal function (Table 5).

\textbf{f. Anti-Inflammatories}

Inflammation is one of the defensive responses of our body. However, this is also the cause of discomfort and consequently anti-inflammatory agents are part of formulations in gastrointestinal disorders.

There are 40 species with anti-inflammatory activity, none with this as the sole function (Table 5). \textit{Psoralea corylifolia} has antidysenteric, and purgative activity in addition to anti-inflammatory effect. Other species have additional therapeutic effects.
g. Antipyretics

Fever is a common symptom of many gastrointestinal disorders and is sought to be brought under control at the earliest. There are 47 species with antipyretic activity but none is exclusively antipyretic (Table 5). Cassia fistula (purgative), Manilkara hexandra (emetic), Plumbago zeylanica (anti-pyretic), Prunus cerasus (anti-purgative) and Uraria picta (expectorant) have the effects shown in parenthesis, in addition to being antipyretic (Table 5).

h. Antispasmodics

Antispasmodics relieve muscular spasms in the gastrointestinal tract which are responsible for the throbbing or pain. There are 26 species in the database with antispasmodic activity (Table 5). Ruta graveolens is the only species which is exclusively antispasmodic (Table 5).

Nymphaea alba and Nymphaea nouchali are also antipurgative and demulcent respectively, in addition to being antispasmodic. Other species have additional therapeutic effects.

i. Demulcents

Demulcents allay and soothe irritation particularly of the mucous membranes and are used to restore the gastrointestinal comfort. There are 21 species with demulcent effect (Table 5). Dolichos biflorus is the only
species with an exclusive demulcent activity. This may be due to the galactomannan gum present in the seeds. *Hordeum vulgare* and *Nymphaea nouchali*, also function as refrigerant and antipurgative respectively, in addition to being demulcents (Table 5). Other species possess additional effects.

j. Expectorants

Expectorants eliminate excessive secretions from the respiratory tract through coughing. This effect has no direct relevance to gastrointestinal disorders but if respiratory and gastrointestinal disorders occur simultaneously, expectorant effect is considered beneficial. There are 43 species with expectorant effect (Table 5). These are largely used more for their other therapeutic effects than expectorancy. *Hibiscus mutabilis* is the only excessive expectorant. *Punica granatum* is an antipurgative in addition to being an expectorant while *Saccharum officinarum* is an antibacterial and *Uraria picta* an antipyretic.

k. Refrigerants

Refrigerants impart a cool comfortable feeling in the stomach and the intestines. There are 30 species with refrigerant effect (Table 5). Only *Cocos nucifera* is an exclusive refrigerant and is consumed in large quantities during gastrointestinal disorders.
Hordeum vulgare functions as a demulcent in addition to being a refrigerant. Many other effects are exercised by the remaining species.

1. Stimulants

There are 42 species which act as stimulants whose function is to increase gastrointestinal activity (Table 5). Prunus cerasioides is the only species that has the exclusive activity of stimulance. Angelica glauca and Flacourtia indica have also carminative and antipurgative effects respectively, in addition to stimulating activity. Other species have many other effects.

m. Stomachics

The main function of stomachics is to increase appetite. Striga lutea is the only species with an exclusive stomachic effect among the 49 species with stomachic activity (Table 5). Flacourtia indica is an antipurgative, in addition to being a stomachic. Picrorhiza kurrooa, one of the very bitter drugs most widely used in formulations of indigenous medicine for treating gastrointestinal disorders, is also a purgative (Table 5). In the case of other species with stomachic activity, additional effects are also associated (Table 5). A very common feature of stomachics is that they are very bitter.