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SHORT COMMUNICATION

# A punched card system for the rapid identification of powdered crude drugs and spices

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Multiple-entry, edge-punched card systems have been introduced as aids in the microscopical analysis of hardwoods (Clarke, 1938; Brazier & Franklin, 1961) and of softwoods (Phillips, 1948). Systems have also been developed for synthetic fibres (Culliford, 1963) and solid dosage forms (McArdle & Skew, 1965). The usefulness of such schemes prompted us to apply a general system to the identification of vegetable materials including powdered crude drugs and spices, with a view to eliminating the tedium of searching the usual identification tables or keys (Claus, 1956; Anon., 1963; Trease & Evans, 1966; Wallis, 1967).

*Preparation of the system*

The microscopical characters of over a hundred powdered crude drugs were systematically tabulated and then grouped according to types of tissues, cells, cell contents, etc., as follows: I Epidermis, II Covering Trichomes, III Glandular Trichomes, IV Cork, V Parenchyma, VI Sclereids/Lignified Parenchyma, VII Fibres, VIII Vessels/Tracheids, IX Sieve Tubes, X Pollen, XI Fibrous Layer of Anther, XII Lamina, XIII Medullary Rays, XIV Oil Glands/Vittae, XV Epiphytes, XVI Lignified Rods, XVII Starch, XVIII Calcium Oxalate, XIX Other Cell Contents.

For most of the groups several appropriate descriptive characters were selected so that a total of 106 characters was available for the scheme and they were arranged as shown on the key card (Fig. 1).

Each character was strictly defined so that all users of the system adhere to the same interpretation of the various parameters described. For example, in this system we define parenchyma (V) as thin-walled, non-lignified, unspecialized cells and thus all kinds of so-called lignified parenchyma are not included here, but under VI. This is necessary because in some powdered vegetable materials it is virtually impossible to decide whether particular cells are lignified parenchyma or thin-walled sclereids. A definite delineation is required between isodiametric sclereids (VI, 44) and elongated sclereids (VI, 45), and between the latter and fibres (VII). Here a strict numerical criterion is laid down, namely that an elongated sclereid has a length equal to at least twice its maximum diameter and a fibre has a length equal to at least ten times its maximum diameter.

Table 1 lists the characters present in individual crude drugs and spices. This was compiled after microscopical examination of authentic powdered materials and by consulting published literature (Winton & Winton, 1932–1939; Trease & Evans, 1966; Wallis, 1967; B.P., 1968; B.P.C., 1968; Jackson & Snowdon, 1968). An individual key-card for each drug or spice was then prepared. Each character

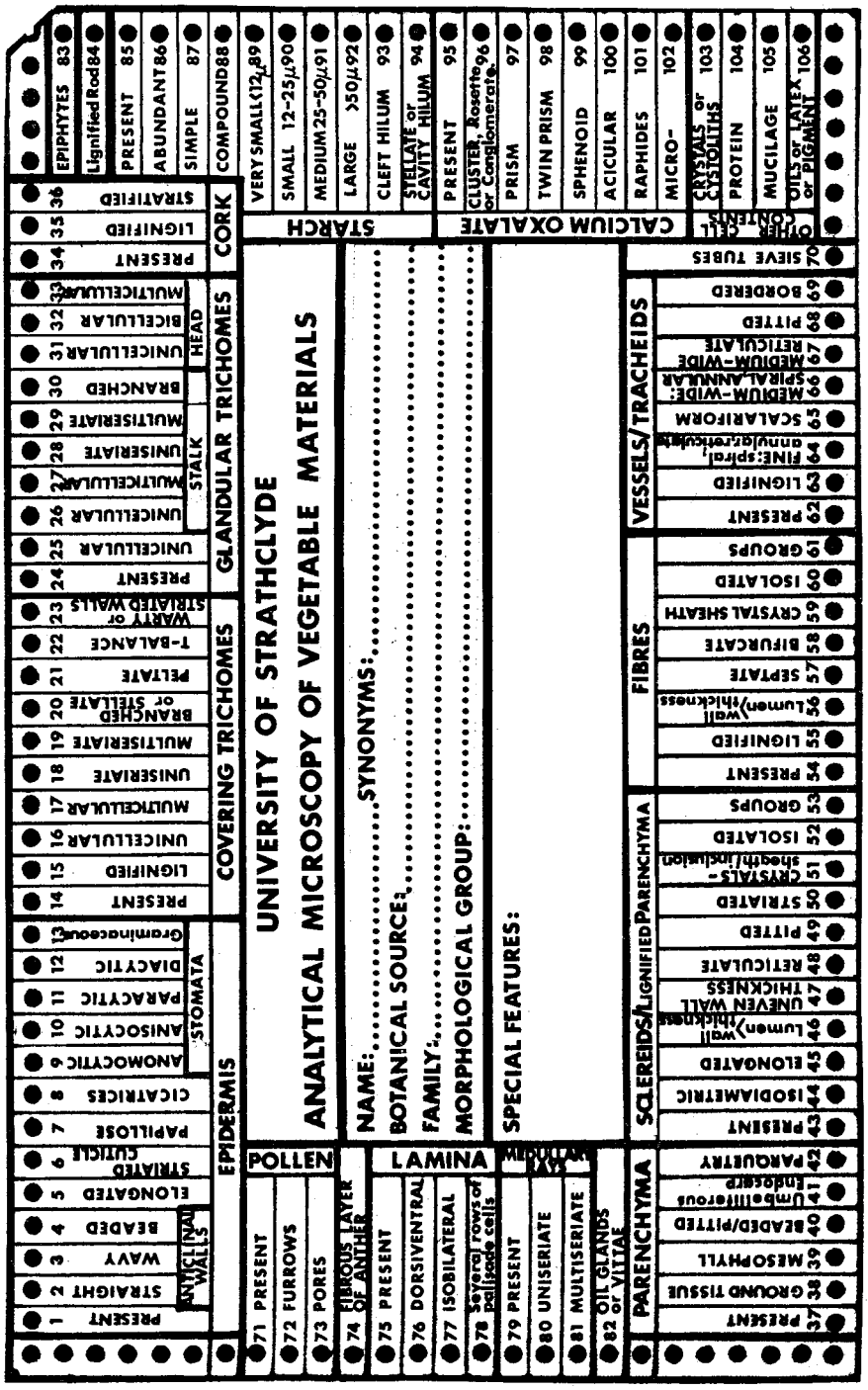


FIG. 1. Multiple entry card.

invariably present in the powder was clipped (Fig. 2a) and where a character is normally present in but small amount, or is only sometimes present, it was marked with an inked notch (Fig. 2b). On each card the botanical source, family, common

Table 1. *Keys for selected crude drugs*

| Morphological group | Drug | Characters |
|---|---|---|
| Barks | Cascara | 34, 37, 38, 40, 43, 44, 45, 49, 50, 51, 53, 54, 55, 59, 61, 70, 79, 81, 83, 85*, 87, 89, 95, 96, 97, 106 |
| | Frangula | 34, 37, 38, 40, 54, 55, 59, 61, 70, 79, 81, 83, 85*, 87, 89, 90*, 95, 96, 97, 106 |
| | Wild cherry | 34, 37, 38, 43, 44, 45*, 49, 50, 52*, 53, 54*, 55, 56, 60, 62*, 63, 68, 69, 79, 80, 81, 83, 85, 87, 88*, 89, 90, 95, 96, 97, 106 |
| Fruits | Anise | 1, 2, 4, 6, 9, 14, 16, 23, 37, 38, 41, 43, 44, 46, 49, 53, 54, 55, 56, 61, 62, 63, 64, 82, 95, 96, 102, 104, 106 |
| | Coriander | 1, 2, 9*, 37, 38, 41, 42, 43, 44, 45, 46*, 49, 53, 54, 55, 56, 61, 62, 63, 64, 82, 95, 96, 97, 102, 104, 106 |
| | Capsicum (pedicals and calyces present) | 1, 2, 3*, 4,* 6*, 9*, 10, 14, 16, 17, 18, 23, 24, 26, 27*, 33, 37, 38, 43, 44, 45*, 46, 47*, 49, 50*, 53, 62*, 63, 64, 95, 99, 102, 104, 106 |
| | Capsicum (pedicels and calyces absent) | 1, 2, 3*, 4*, 6*, 37, 38, 43, 44, 45*, 46, 47*, 49, 50*, 53, 62*, 63, 64, 95, 99, 102, 104, 106 |
| Seeds | Cardamom | 1, 2, 5, 37, 38, 40*, 43, 45, 47, 53, 62*, 63, 64, 85, 86, 87, 88, 89, 90, 95, 97, 102, 103, 104, 106 |
| | Nux-vomica | 1, 2, 14, 15, 16, 37, 38, 43, 45, 53, 84, 106 |
| | Strophanthus | 1, 2, 6*, 8, 14, 15, 16, 37, 38, 43, 44, 46, 53, 62*, 63, 64, 84, 95*, 96, 97, 102, 104, 106 |
| Underground organs | Ginger | 37, 38, 54, 56, 57, 61, 62, 64*, 67, 85, 86, 87, 89, 90, 91, 106 |
| | Liquorice (unpeeled) | 34, 37, 38, 43, 44, 45, 46, 49, 53, 54, 59, 61, 62, 63, 68, 69, 70, 79, 80, 81, 85, 86, 87, 88*, 89, 90, 95, 97 |
| | Liquorice (peeled) | 37, 38, 43, 44, 45, 46, 49, 53, 54, 55, 59, 61, 62, 63, 68, 69, 70, 79, 80, 81, 85, 86, 87, 88*, 89, 90, 95, 97 |
| | Rauwolfia | 34, 35, 36, 37*, 38, 43, 44, 46, 49, 53, 54, 55, 56, 58, 60*, 61, 62, 63, 68, 69, 79, 80, 81, 85, 86, 87, 88*, 89, 90, 91*, 93*, 94*, 95, 96, 97 |
| Leaves and herbs | Digitalis | 1, 2, 3, 4*, 8, 9, 14, 17, 18, 23, 24, 26, 27*, 28, 31*, 32, 37, 38*, 39, 62, 63, 64, 75, 76 |
| | Belladonna herb | 1, 3, 6, 10, 14*, 17, 18, 24, 26, 27, 28, 30, 31, 33, 37, 38*, 39, 43*, 45, 46, 49, 54*, 55, 56, 60, 61, 62, 63, 64, 67, 71, 72, 73, 74*, 75, 76, 95, 97*, 99, 102 |
| | Stramonium | 1, 2, 3, 10, 14, 17, 18, 23, 24, 26, 33, 37, 38*, 39, 62, 63, 64, 71, 73, 74*, 75, 76, 95, 96, 97*, 99*, 102* |
| Inflorescences and flowers | Clove | 1, 2, 3*, 6*, 9, 37, 38, 39, 40, 43*, 44, 49, 50, 52, 53, 54, 55, 60, 61*, 62, 63, 64, 71, 72, 73, 74, 75, 82, 95, 96, 106. |
| | Chamomile | 1, 2*, 3*, 5, 6*, 7*, 9, 14, 17, 18, 23, 24, 29, 32, 33, 37, 39, 43, 45, 46, 49, 53, 62, 63, 64, 71, 72, 73, 74, 75, 95, 96, 102 |
| | Pyrethrum | 1, 3, 4*, 5, 6*, 7*, 9, 14, 17, 22, 24, 27, 29, 32, 33, 37, 39, 43, 44, 45, 46, 49, 50*, 51, 53, 62, 63, 64, 71, 72, 73, 74, 75, 95, 96, 97, 102, 106 |

* Characters of rare occurrence.

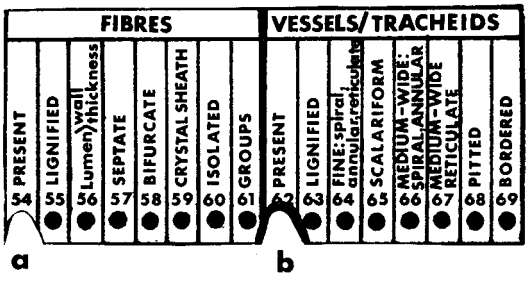


FIG. 2. Part of card showing method of recording characters, a, character invariably present: b, character normally present in small amount or only sometimes present (notch with inked edge).

names and synonyms for the drug were recorded along with the morphological group to which it belongs and any special characters not listed elsewhere on the key-card.

*Use of the system in analysis*

During the microscopical examination of an unknown powder the characters found are listed, those of rare occurrence being marked with an asterisk (see Table 1) and any about which there is doubt, queried.

The cards are then aligned and a needle inserted through an appropriate perforation. Cards positive for that character fall out. The process is then repeated until no more can be selected in this way. Further selection may be possible by the use of characters which are absent.

With most single powders it is possible to select the one correct card; where more than one card is left, however, it is usually possible to make a positive identification by further examination of the powder. In all cases it is advisable to check identification by comparison with authenticated material and published descriptions.

Where a mixture of drugs is examined, the system is used in a similar way. In recording the observations, those characters found in the same piece, or in obviously related pieces of tissue, are listed together while characters such as starch, which could occur in any of the components, are listed as *possibly* present. Making use of the list of characters known to be related, a selection of cards is then made and those characters on the second list are used both positively and negatively until a definite diagnosis can be achieved. This is repeated for each component. Comparisons with authentic materials, etc., are again made and it may be advantageous to prepare and examine a known mixture of the relevant drugs as a final check.

*Discussion*

With this key-card system there is a fundamentally different approach to the analysis of powdered vegetable materials, in that the analyst does not need to know in detail the characters of any individual powder but rather has to be able to identify the basic anatomical characters recorded in the system. Time can be saved both in training the analyst and in his handling of any unknown vegetable powder.

Experience in using the system with students has shown that the identification of single powders can be effected quickly and that with mixtures of two or three components the system is also useful. With more experienced workers it is anticipated that more complex mixtures will also be readily analysed.

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