TESTS FOR GANJA AND OTHER PRODUCTS FROM INDIAN HEMP (CANNABIS INDICA).

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The Indian Hemp (*Cannabis indica*) yields three different products, viz :—

1. Ganja, consisting of the flowering and fruiting heads of the unfertilised female plant, is collected from well manured and cultivated plants. The name "guaza" is sometimes given to Bombay ganja which is inferior to the Calcutta drug and is sold in flat cakes.
2. Bhang, consisting of the selected dried leaves and small stalks from unfertilised female plants.
3. Charas, the resin as it exudes from the plant.

All three products are used as intoxicants. They are sometimes made into sweetmeats by mixing with honey, sugar and aromatic spices and are then eaten, but more commonly they are smoked either alone or with tobacco.

The substances are also used as ingredients in certain medicinal preparations.

The term "hashish" is used somewhat indefinitely and is frequently applied to drugs made from charas and containing other toxic ingredients.

The following is a list of the more important papers dealing with *Cannabis indica* :—

(a) *Cultivation and Manufacture.*

1. Report on Cultivation and uses of Ganja, by D. Prain, Calcutta, 1893.
2. Cultivation and Manufacture of official *C. indica*. by Wm. Mair, Pharm. J., 1900, *65*, 732.

3. *Cannabis indica*, by E. M. Holmes. ibid., 1902, *69*, 129; 1900, *64*, 522.

(b) *Physiological effects.*

4. Effects of *C. indica* and its products, by W. E. Dixon, Medical J., 1899, 1354.

5. Activity of *C. indica*, by C. R. Marshall, Pharm J. 1902, *68*, 362; 1909, *82*, 418.

(c) *Chemistry of C. indica.*

6. Cannabinol, the active constituent of Hemp, by Wood, Spivey and Easterfield, J. C. S., 1896, *69*, 539; 1899, *75*, 20.

7. Chemistry of *C. indica*, by J. Humphrey, Pharm. J. 1902, *68*, 363, 392.

8. Chemistry and Pharmacology of Hashish, by S. Fraenkel, Arch. Exp. Path. Pharmak, 1903, *49*, 266; abstract in Chem. Centr., 1903, II, 199.

9. Cannabinol, the active constitutent of Hashish, by M. Czerkis, Annalen, 1907, *351*, 467.

(d) *Valuation of the drug.*

10. Note on *C. indica*, by T. Maben, Pharm. J., 1902, *69*, 131.

11. Preparations of *C. indica*, by L. W Famulener and A. B. Lyons, Proc. Amer. Pharm. Ass., 1903, abstract in Pharm J., 1903, *71*, 548.

12. The valuation of Indian Hemp, by D. Hooper. Pharm. J., 1908, *81*, 80.

13. Testing of *C. indica*, by Wm. Martin, Pharm, J., 1909, *83*, 149.

14. Standardisation for Preparations of Indian Hemp, by C. R. Marshall and J. H. Wigner, Pharm J., 1911, *86*, 739.

15. Standardisation of Indian Hemp, by C. R. Marshall and J. K. Wood, Brit. Med. J., 1912, 2234.

16. Tests for Hashish, by Wm. Beam, Wellcome Tropical Research Laboratory, Khartoum, Chemical Section No. 3, April 1915.

(c) Extracts of the drug and comparison with Hemp grown in other countries.

17. Extracts and Tincture of Indian Hemp, by G. F. Merson, Pharm. J., 1912, *68*, 234.

18. Greek Hashish, Pharm. J., 1908, *80*, 205.

19. Extract of Indian Hemp, by H. Deane, Pharm. J., 1911, *87*, 160.

20. American Cannabis, by C. R. Eckler and F. A. Miller, Amer. Pharm. J., 1912, 488, abstract in Pharm. J., 1912, *89*, 811.

The physicologically active principle of Indian Hemp appears to be a resinous hydroxlic compound termed Cannabinol, $C_{21}H_{26}O$ (OH), which is readily extracted by light petroleum. It distils at 230° under a pressure of 0·1 min (Czerxis), dissolves readily in most organic solvents, is readily oxidised and gives a red colour with alkalis.

There appears to be no simple chemical method of estimating the amount of the active principle in different preparations.

The ordinary pharmaceutical method is to determine the amount of the material extracted by 90 per cent alcohol and the ash content. (See B. P., 1914, 82). Hooper stated that the determination of the iodine value of the alcoholic extract gives an indication of the relative age and activity of the preparation, but Marshall and Winger have heen able to show that there is no definite relationship between the iodine value and the physiological activity of different samples. Marshal and Wood examined the acetylation method but found that of no value.

The general consensus of opinion is that the only reliable method for determining the pharmaceutical value of a preparation is to study its physiological action on dogs. This method appears to be generaly adopted in America. Martin uses 5 grams of the extract in the form of pills adminstered in two different doses viz. 3 grams and after an interval of two hours 2 grams. Suitable dogs appear to be Fox—or Irish—terriers and the method isto note the onset and duration of incoordination of movement, of muscular weakness and of other symptoms. As dogs very somewhat it is essential to administer the drug to more than one animal. Maben recommends using 1·0 to 1·5 mg. per kilo weight of dog.

It is well known that preparations lose their activity when kept. The extract and fluid extract are comparatively stable, but powdered preparations readily lose their activity. Various experiments made by Marshall indicate that the loss of activity appears to be due to the oxidation of the Cannabinol present. When kept in sealed tubes for 10 years there is very little loss of activity, whereas preparations kept in the air deteriorate rapidly year by year. When oxygen is passed into Cannabinol heated at 160° a brown colour is developed and the activity is destroyed; carbon dioxide under similar conditions has little or no effect.

The activity of African, American and European grown materials is always much inferior to that of Indian grown Cannabis.

In India, a duty is levied on all products containing Cannabis indica and some sample method of detecting the presence of the drug in smoking mixtures and medicinal preparations is greatly needed.

W. Beam in Tests for Hashish describes the following as a reaction given by all samples of hashish from India, Egypt, Soudan and Uganda.

A cold petroleum ether extract is made and evaporated in a short test tube. To the residue a few cubic centimetres of a saturated solution of hydrogen chloride in absolute alcohol are added. In the presence of *Cannabis* the liquid assumes a bright cherry red colour, which disappears on dilution with alcohol or water. Some 200 plant extracts, alkaloids and glucosides were examined but did not give the reaction.

Certain volatile oils *e. g.* origanum and sandalwood gave a similar reaction but the colour was far less intense.

A reaction, which had been described by Beam in 1911 (Fourth Annual report of the Wellcome Tropical Research Laboratories, Khartoum 1911, 25) viz. adding a few drops of a 0·05 N. solution of alcoholic potash to the residue from the cold petroleum ether extract and the formation of a rich purple or reddish purple coloration, was found to give negative results with the ordinary extract of C. indica from the B. P. and with several samples of Indian Ganja.

We carried out a number of experiments before we were aware of Beam's results and found that the following reaction appears to be characteristic of products from *C. indica*.

0·1 gram of the substance is boiled with 1 c.c, of glacial acetic acid for 1 minute and a few drops of the clear liquid are filtered onto a watch glass or small porcelain dish and the solution touched with a glass rod which has been dipped in a 20 per cent aqueous solution of sodium nitrite. All the *C. indica* samples we have tested produced a reddish brown coloration. The solution is then evaporated on the water bath, when an orange-red resinous residue is obtained, which is insoluble in dilute ammonia (1 in 10).

The simple production of the reddish brown colour with traces of sodium nitrite is not a sufficient test as various other vegetable products give a similar reaction. The formation of a deep orange red residue which is insoluble in dilute ammonia, appears to be quite characteristic, as we have examined about 100 samples of all types of vegetable products, but in no case has the above reaction been obtained.

In some cases a yellow residue was obtained but this was always readily soluble in dilute ammonia.

Among the substances which have been examined are the following:—

A. Resins and Gums.

Hardwickia pinnata, White dammar (Veteria indica), Dipterocarpus indicus, rosin, lac resin, Boswellia serratta, Gum acacia, Gum benzoin, balsam of tolu.

B. Alkaloids etc.

Brucine, cocaine, novocaine, β-eucaine, holocaine berberine, strychnine, morphine, codeine, papaverine, cinchonine, quinine, caffeine, atropine, cinchonidine, narcotine, piperine, thebaine, strypticin, hyocyamine coniine, santonin, narceine, quinidine, opium, belladonna.

C. Oils and oil cakes.

Gingelly, ground nut, hongai, ippi, cocoanut, cotton seed oils and the corresponding cakes. Dill apiol, Sandalwood oil.

D. Leaves, seeds etc.

Leaves, of mango, babul, lantana, aloe, banyan, kachi-grass; seeds of Cassia alata and Schleicheria trijuga; camphor, tea fluff.

E. Vegetable. Extracts etc.

Sp. ammoniæ aromaticus and various other extracts and tinctures.

The reaction is of a qualitative nature only and apparently is given by both fresh and old samples. It is probable that it does not depend upon the presence of cannabinol as specimens of ganja several years old give the reaction quite distinctly.

So far we have not tried any experiments of a quantitative nature, but undoubtedly the colour obtained varies from a golden yellow when Sidhi (leaves of *C. indica*) is used to a rich red when charas is employed.

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