RESEARCH ON MEDICINAL AND POISONOUS PLANTS*

WORK on medicinal plants was started by my colleagues and myself nearly twenty years ago. Our first main objective was to make India self-supporting by enabling her to utilize drugs produced in the country. There are a number of drugs of established therapeutic value which are in use in the pharmacopœias of different countries. The majority of these grow wild in great profusion in many parts of India and a certain number are even cultivated. If these resources could be utilized and the finished products manufactured, treatment of many diseases could be brought within the means of the Indian masses, whose economic condition is unfortunately of a very low order.

A number of important drugs, extensively used by the medical profession, however, are neither found wild nor have so far been cultivated in India. Cultivation of such drugs is very important from an economic point of view, and scientific research in this direction, as is being carried out in other countries, would be very fruitful. It is a matter for regret that India is still importing large quantities of crude drugs in spite of the fact that practically every conceivable pharmacopœial drug can be grown within her bounds. The history of the cultivation of cinchona, eucalyptus, digitalis, etc., in India, clearly shows that the cultivation of medicinal plants is pregnant with rich possibilities if taken up on proper lines. It is gratifying to note that more and more interest is now being taken in this direction. A list of medicinal plants which might with advantage be cultivated has been prepared and is available for those interested in such development.

Our second objective has been to discover remedies from the claims of *Ayurvedic, Tibbi* and other indigenous resources suitable for employment by exponents of Western medicine. Since the period of decay and resuscitation of old systems of Indian medicine, many of the effective remedies have been lost while a number of uncertain ones have crept in. Belief in their efficacy originates in some cases from the teachings of the ancient commentators and is based on clinical data, but in others has no foundation whatever. Nearly two hundred medicinal plants have been investigated in our laboratories and some of these have been shown to be of practical utility. Apart from this, the negative value of such investigations should not be lost sight of. Whatever the merits or demerits of the indigenous systems may be, it should be remembered that they minister to the needs of nearly 80 per cent. of the population of this vast country. It is, therefore, the primary duty of any research organisation existing in this country to evaluate their effectiveness and practical utility.

* From the Presidential Address by Brevet-Col. R. N. Chopra, SC.D., I.M.S. (Retd.), Director, School of Tropical Medicine, Calcutta; Annual Meeting of the *National Institute of Sciences, of India*, Madras, 1940.

COLLECTION OF DRUGS

During the last twenty-five years several drugs of Indian origin have assumed considerable importance from the point of view of foreign trade. Many firms of drug manufacturers in this country also use the locally produced raw materials for the manufacture of the finished products. It is a matter of very great concern, therefore, that the crude drugs collected locally are often not up to the required standard and this has resulted in considerable economic loss. Collectors of medicinal drugs growing in a state of nature, and the present and prospective cultivators should bear in mind that there are certain factors which have to be considered in order to obtain the standard product. There is a good deal of variation in the active principles in the different parts of a plant and in different seasons in the same part of the plant. Plants collected at the proper time, when the active principles are at their maximum, give very effective results. Collection of drugs in the case of plants under cultivation can be carried out under controlled conditions. It has, however, to be admitted that the ideal conditions for the collection of even many of the common and important medicinal plants are not known with precision and research is urgently needed to determine the time when the active principles are at their maximum under the environments existing in this country, as was done by the Dutch in Java in the case of cinchona. If this could be systematically carried out, India could supply the whole of the world with medicinal 'herbs'.

POISONOUS PLANTS

Intimately connected with the study of medicinal plants is the problem of poisonous plants, but till recently little attention has been paid to this study in this country. They contain chemical constituents which, if introduced into the body of an animal, in relatively small quantities, act deleteriously and may cause serious impairment of bodily functions or even death. Apart from the utilisation of their potent properties in the treatment of diseases to alleviate the sufferings of man and animals, there appears to be no doubt that they are a source of great menace in India through poisoning of livestock.

We are concerned in this country with the welfare of 360 millions of human beings, as well as with that of roughly 220 millions of the bovine population out of a total of about 730 millions in the whole world. Even in its present unsatisfactory condition, the cattle industry contributes roughly about 10,000 million rupees to the annual agricultural income of 20,000 million rupees of this vast country. The importance of plants which are poisonous to livestock, will thus be readily understood. It is a matter for regret that no systematic attempts have been made in India so far to investigate these plants on scientific lines with a view to devising means by which this menace could be controlled.

Another aspect of these plants which will repay study concerns those which have insecticidal

and insect repellent properties. Losses inflicted upon India by insects are enormous and at a moderate estimate are calculated at 2,000 million rupees annually and over a million and half of human lives. Effective defence against these enemies of social and economic progress should materially reduce this enormous wastage and facilitate national development. The finding of cheap insecticides for the diverse needs of agriculture, destruction of household pests, prevention of vectors of such diseases as malaria and many others borne by insects commensurate with the limited means of the masses in India, are important problems to which little attention has been paid till recently. Vegetable insecticides are preferable to mineral ones, as these are less deleterious to man and warm-blooded animals generally, and as they are also less harmful from the point of view of agriculture.

Herbarium of Medicinal and Poisonous Plants

One of the chief difficulties in connection with our work on medicinal and poisonous plants has been the proper identification of the material to be investigated. The descriptions of plants given in the literature on indigenous medicine are meagre and vague and this has resulted in considerable confusion. Many drugs are sold under different names, different drugs under the same name, and even the learned *Kavirajs* and *Hakims* cannot say with certainty which species are meant in the old text-books. No authentic specimens of even well-known remedies were ever collected and preserved by the exponents of indigenous medicine and no actual comparison is possible. With a view to combating this state of affairs it was considered desirable to collect authentic specimens of all the plants with alleged medicinal or toxic properties and after proper identification preserve them for the purpose of comparison. This work has progressed and it has been possible to collect 6,000 specimen sheets of about 16,000 species. About 900 species have yet to be obtained to complete the collection of all the known medicinal and poisonous plants growing in India. The present collection will, it is hoped, form the nucleus for a *National Herbarium* of medicinal and poisonous plants.

Survey of Medicinal and Poisonous Plants

A question of great economic importance is the working out of the distribution of medicinal and poisonous plants in this country. The distribution of many plants as described in literature is often vague and inaccuracies, which have crept in, have been passed down from one publication to another. To avoid confusion for future workers in the field, a stock-taking of the present distribution of medicinal and poisonous plants was started. All the available literature is being consulted and herbaria all over India are being scrutinized. Valuable information is thus being collected, and this will be of practical value to those interested in harnessing the natural resources of the country. This will also give indications of suitable localities for the cultivation of medicinal plants.

From the point of view of poisonous plants also, this survey is of great practical value, as once the occurrence of the harmful herbage in grasslands and other localities open to grazing for livestock are mapped, it should be possible to adopt measures for the protection of livestock against the menace of poisoning.

From the brief review, it will be apparent that the study of medicinal and poisonous plants offer a stimulating field for investigation and is of great economic importance to India as well. A teamwork between chemists, botanists, pharmacologists, agriculturists and clinicians is needed before problems of this nature can be properly tackled and solved. Every attempt should be made to develop this teamwork between scientists in this country, if any tangible results of economic and agricultural importance is to follow.

SCIENCE NOTES AND NEWS

Anomalous Diffusion.—Freundlich and Krüger, in a recent paper (*Trans. Faraday Soc.*, 1939, 43, 981) have given a direct proof of "diffusion rétrograde". If salts (potassium chloride, potassium sulphate, sodium chloride) diffuse in an aqueous solution of a second solute (quinone, succinic acid), the latter being uniformly distributed at the outset, the second substance markedly changes its distribution in the region where the concentration gradient of the salt is steep. A correlation has been possible between this effect and the influence of salts on the solubility of the second solute. If the solubility of the second solute is decreased by the salt, as is the case, for instance, with quinone and potassium sulphate, then a decrease of quinone concentration occurs on the salt side of the boundary and an increase occurs on the water side. If the solubility of the second solute is increased by the salt as is the case with quinone and potassium nitrate, the shift in concentration has the opposite sense.

K. S. G. D.

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De Haas-Van Alphen Effect.—At ordinary room temperature, the diamagnetic susceptibility of a crystal of pure bismuth is independent of the magnetic field in which the crystal is placed. When the temperature is lowered, however, the susceptibility is no more independent of the field strength but is a complicated periodic function of the same. This periodicity depends on purity of the crystal as well as temperature. De Haas and Van Alphen[1, 2, 3, 4] were the first to find this effect. This was later studied by Van Alphen[6] as well as by Shoenberg and Zaki Uddin[7,8] at Cambridge. A theory