

is not particularly surprising that small differences might occur but only in one case does the difference in results between males and females appear significant. This is the case of Manchurian "A" where the acid test produces odds of approximately 175:1 of significance, indicating the difference between males and females may be partly varietal. Although Table V shows results in which the males in every case were stronger than the females, previous results in 1938 were not as consistent in this respect. In fact, from six varieties tested only three had male plants stronger than the females. It is interesting to note that the male plants responded as strong if not stronger than the females. The general practice in the past of collecting the resins in Asia has been principally from the female plants.

It is difficult to conclude from these results that sex plays any important role in the response to either the alkaline or the acid test. Possibly small differences may exist and with a greater number of determinations future work may prove the small differences to be significant but from a practical point of view it seems doubtful if the differences which have been found here have any importance.

ALKALINE VS. ACID TEST

Mention has been made earlier in this article that there existed little or no positive correlation between these two tests. This is true if the sexes are grouped together or the females segregated from the males. Coefficients of correlation as determined for plants between the alkaline and acid tests were obtained on hemp plants grown in 1938. None of these proved large, *i. e.*, $r = 0.17 \pm 0.08$ for female plants of a China variety and 0.26 ± 0.08 for male plants of the same variety. Even smaller coefficients were obtained for plants of a Roumanian and Italian varieties.

QUANTITATIVE DIFFERENCES IN RESINS PRODUCED

Table VI shows the results obtained in extracting samples of leaves with petroleum ether. The results of the first sampling in Virginia are missing as the plants were too small at harvest to furnish material for petroleum ether extraction after the removal of material for the Beam tests. There is easily observed in Table VI the consistent increase in resins that takes place as the plants mature. Of the four varieties of hemp tested, African "C" gave approximately 57% more resins in extraction than Manchurian "B." Of the four regions studied, Nebraska gave approximately 40% more resins than Mississippi. The analysis of variance shows the marked influence that maturity, varieties and environment have on the production of the resins. The analysis of covariance presented in Table VI indicates the strong relationship between the resin results and the acid Beam test numbers which does not differ for different varieties, locations or harvests. No such marked relationship is indicated between the resin content and the alkaline Beam test response.

CONCLUSIONS

It is concluded that the climatic conditions under which *Cannabis sativa* is grown influence response to the acid and alkaline Beam tests but that this effect is small as compared with that of agronomic variety.

The quantity of resins produced by plants is influenced by plant maturity, variety and environment. The relationship between the resin content and acid Beam test numbers is strong and the same for different varieties, different locations and different harvests.

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The Clone in Pharmacognosy

*By William J. Bonisteel**

The concept of the genus (1) was the basis for a symposium at the joint meeting of the Botanical Society of America and the American Society of Plant Taxonomists held at Indianapolis, December 29, 1937. Students of plant life have been working for centuries upon the problems of classification, and while the accomplishment has been great, much remains to be done and in some groups a satisfactory system may never be attained. The problem of species has always been a difficult one. With intergrading characters present, it is possible to have almost as many species as there are individuals. Species splitting can be carried to such an extreme that only a specialist in that field would be able to identify the plant in question.

The sub-species and its various forms are a grouping that is used extensively. In the current U. S. P., this system is followed in many cases. Under the drug, aconite, both sub-species and varieties are used in the defi-

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dition. In other cases hybrid is used under cinchona and rhubarb. The ecologist uses the word *ecad* to signify a form arising by adaptation to environment. Senna is an example of a plant which when placed under excellent conditions of environment (cultivation in this case) produces leaflets that are twice the size of the wild plants. The *variant* is a form arising from variation, the *mutant* from mutations. The *hybrid* is a form which arises from the union of two unlike gametes. Types of bacteria have been recognized for a long period of time. Races and strains are well established in the literature. It has been proposed that such races and strains should be numbered. Such a plan has many good points.

During the last few decades the plant breeder and geneticist have been developing new and improved forms of plant life. The cytologist has been furnishing valuable information which has led to the development of cyto-genetics, which is playing an important part in the elucidation of the many problems of taxonomy. The important fact that is being established by this group is the development of a system of pedigreed cultures that enable one to know definitely from which plant these new types were derived. It must not be overlooked that many of these forms, which the plant breeder is developing, may also occur in nature. Many plants fail to set seed and may only be propagated by asexual multiplication. While never clearly stated, it is the implied suggestion that many sub-species and varieties in the seed plants set seed or at least feebly so. On the other hand, many of these plants are sterile. Such sterile plants must have arisen from a seedling or seedlings which gave rise to the plants in question.

In a previous series of papers (2, 3), Sparks Aconite was investigated and found to be a sterile plant and such is to be designated as a *clone*. Cytological investigation showed that this plant was a triploid and three sets of eight chromosomes were found in the somatic tissues of the root tip. Two of the sets of eight chromosomes are alike and they are assumed to have arisen from a tetraploid aconite or from a diploid aconite in which one gamete was unreduced. The other set

of eight chromosomes are assumed to be a gamete from a diploid plant. Seed production has never been observed in this clone. Neither has it set seed in numerous controlled close-pollinations or hybridizing pollinations. Controlled hybridizing experiments have led to the development of many aconites from diploid and tetraploid species. Many of the plants do not set seed due to failures in meiosis. A specific word should be used that clearly establishes the identity of such a plant.

The *clone* is the collective name for all the plants asexually reproduced by division, grafting, etc., from one (seedling) individual. Such a group of organisms are descended by mitosis from a common ancestor. The propagating of apples by grafting is merely a method of clonal propagation. The Ben Davis apple and Concord grape are recognized in the nursery trade as varieties when it would be more fitting to call them clones. The use of the term clone was suggested by Webber (4) in 1903. Stout (5) has discussed the question of the clone in considerable detail in the *Journal of the New York Botanical Garden*. Stout has shown that the "Balm-of-Gilead" poplar exists only as a female tree and that the plant has been propagated by cuttings. The evidence seems to indicate that such a tree arose from one individual seedling and has been propagated by repeated multiplications. Such a plant is clearly a clone. In the current National Formulary, the plant designated as Poplar Buds is given a species and generic rank. The plant was named *Populus candicans* by Alton in 1789. Both male and female flowers were described and it is evident that he was dealing with two distinct plants. The history of this poplar is so well treated in Stout's article that one should read the original for full details. Since this article was published in 1929, the Committee on Nomenclature should have been aware of this investigation and made the correction so clearly indicated in the monograph. Revision of both the U. S. P. and N. F. should be conducted so that they will be examples of the precision that the developments of modern research provide.

It is known that many of the hybrids of

rhubarb are sterile or at least set seed poorly. Both peppermint and spearmint are drug plants whose taxonomic positions are not clear. It is essential in dealing with economic plants that the constituents derived from them shall be uniform as far as is possible. In the genus *Aconitum* (3), it has been shown that many of the so-called species and varieties are subject to considerable variation in both their chemistry and cytology. The establishment of a clonal type of plant would assure uniform progeny and chemical constituents. In the life history of certain known clones no variation has been observed.

In "Standardized Plant Names" (6), the conception of the clone is not considered. Yet Sparks *Aconite* is listed as "*Aconitum Napellus*, *Spark's Variety*." In the A. Ph. A. Monograph on *Aconite* (7), Sparks *Aconite* is listed as *Aconitum Napellus* var. *Sparkii*. Both of these citations are errors since the plant was named after a man by the name of Sparks and one cannot permit the cutting of a letter of a name according to the rules of nomenclature.

It is suggested that, in the monographs of drug plants, the word clone be used to designate those plants which are propagated vegetatively from one single seedling. That it is necessary to relate this plant, as far as it has been ascertained, to its nearest species is well understood.

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Drug Extraction. XXIII. The Extraction of *Ipomea**

By William J. Husa† and Thomas J. Macek‡

As part of their study of the official resins Husa and Fehder (1) reported on the relative value of different menstrua in the extraction of *ipomea*. They found that alcohol was preferable to the alcohol-water (9:1) mixture recommended by the N. F. VI. In the present investigation a further study has been made on *ipomea* and a report is presented on the relative merits of different methods of extraction of the drug.

EXPERIMENTAL

Materials Used.—*Ipomea*, N. F., in moderately coarse (No. 40) powder obtained from two different sources was used. Drug *A* contained 20.51 per cent resin and 8.22 per cent moisture. Drug *B* contained 20.53 per cent resin and 8.54 per cent moisture. Alcohol was used as the menstruum.

Analytical Methods.—The resin content of *ipomea* was determined by a modified N. F. VI Assay Method (see Experiment 1). Resin determinations on liquids were made by the N. F. VI Method. Moisture was determined by the U. S. P. XI Method for drugs containing no constituents volatile at 100° C. To determine total extractive, an aliquot sample of liquid was evaporated to apparent dryness on a water bath, the residue treated with 2 cc. of absolute alcohol and again evaporated to dryness on a water bath; the residue was then heated in an oven at 100° C. until the weight was constant. The hygroscopic nature of the resin and residues necessitated the use of balance desiccators in the balance.

Experiment 1. Variation of Solvent in the N. F. VI Assay of Ipomea.—Since alcohol was found to be the better menstruum for the extraction of *ipomea*, the question arose as to whether the assay for resin content should be conducted according to the directions specified in the N. F. VI, wherein an alcohol-water (9:1) mixture is used as the extracting solvent, or whether alcohol should be employed instead. The following experiment was conducted to determine the efficiency of both alcohol and the alcohol-

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"In almost everything, experience is more valuable than precept"—Quintillian