

## Section on Scientific Papers

Papers Presented at the Fifty-Ninth Convention

### THE CULTIVATION OF MEDICINAL PLANTS AT THE COLLEGE OF PHARMACY OF THE UNIVERSITY OF MINNESOTA.

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The Medicinal Plant Garden of the College of Pharmacy of the University of Minnesota was designed primarily to facilitate and make more comprehensive the instruction in Pharmaceutical Botany and Pharmacognosy. It furnishes one of the essential means of giving instruction pertaining to the vegetable drugs or their preparations. The proper development of such a garden gives the student an excellent idea of the origin of vegetable drugs and not infrequently is the cause of the production of botanical enthusiasts, which all pharmacists should in reality be. The teaching of pharmaceutical botany and pharmacognosy without a medicinal plant garden is not comparable in efficiency with that supported by an adequate drug garden. With such an accessory the students are soon impressed with the distinguishing characters of such families of plants as the *Compositae*, *Solonaceae*, *Umbelliferae*, etc., and they are quickly able to identify such plants as *Digitalis purpurea*, *Verbascum thapsus*, *Inula helenium*, *Hyoscyamus niger*, *Atropa Belladonna*, etc.

While it is true that the growing plant which ultimately yields the drug usually presents an entirely different appearance from the drug itself, this need not mitigate against or complicate the instruction. It rather facilitates it, for a thorough knowledge of the characters of the plant will insure a quick eye to identify the cured product or to detect inferiority in it, and familiarity with the plants soon removes most trouble with nomenclature.

With the decided advantages which such facilities afford in giving instruction in pharmacy courses, it seems strange that so few colleges in this country have up to this time established independent medicinal plant gardens. A number of institutions are so situated that they have access to botanic gardens where many medicinal plants may be found growing. This association, good as it may be, does not meet the urgent need of a medicinal plant garden in close proximity to and under the direct supervision of the college itself.

It is now nineteen years ago that Dean Wulling, realizing the need of such a garden, asked the Board of Regents of the University for a tract of ground and funds to establish medicinal plant cultivation. About fourteen years ago a plot of ground was granted, but no funds were available and hence nothing apparent was accomplished at this time at the college, but Dean Wulling started a garden on a small scale at his home, which, however, he soon after abandoned principally

because of lack of time and area. In the fall of 1910 an appropriation was secured for the establishing of a medicinal plant garden and late this spring the ground which had been granted some fourteen years ago was plowed for the College of Pharmacy and actual work begun.

The garden is admirably located and of about forty thousand square feet in area immediately adjoining the building occupied by the College of Pharmacy. It represents part of the University campus which some time ago was a shallow basin, but which has been filled in during the past few years. On this account the soil is quite varied consisting mostly of light sandy loam with a coating of peat. The plot is surrounded on all sides by buildings which afford considerable protection. After the ground had been plowed and thoroughly harrowed it was staked out into plots of convenient size and shape, for the most part 10 x 18 feet. A few beds of more ornamental design were prepared as the garden was to occupy a rather conspicuous location on the campus.

The question which has frequently been asked in connection with medicinal plant cultivation is, "Where can the seed or plants be obtained to make the start?" Many of our medicinal plants are used as ornamentals and hence American and European seed dealers are able to supply a certain amount of the desired seeds. In case the drug consists of the seed or fruit this, if not too old, may furnish a very valuable means of starting the work of propagation. Samples were taken from the drug collections at the College of Pharmacy of some fifty-eight different drugs and of these thirty germinated, giving in a short time a supply of plants yielding these drugs. This experiment disclosed a rather valuable test for the identification of certain seeds drugs. A sample of *Delphinium consolida* on two germination tests showed the presence of ten per cent. of the seed of an entirely different plant. So close was the similarity of the two seeds that the adulterant would go undetected unless a microscopic examination was resorted to. The reason for the germination of only fifty per cent. of the various seeds tested was probably due to either or both of two causes: first, the age of the seed; and second, injury to the vitality in preparation of the drug.

Among the seeds taken from the drug collection which grew and furnished strong plants may be mentioned those of *Atropa Belladonna*, *Delphinium consolida*, *Conium maculatum*, *Pimpinella Anisum*, *Coriandrum sativum* and others from the *Umbelliferae*, *Delphinium Staphisagria*, *Citrullus Colocynthis*, *Datura stramonium*, *Hyoscyamus niger* and *Lobelia inflata*.

Seeds of the above plants and some fifty others were purchased from New York seed dealers and started in the greenhouse about February 17th. Among the seed sown at this time were those of the following plants: *Inula helenium*, *Capsicum spec.*, *Arnica montana*, *Glycyrrhiza glaba*, *Cytisus scoparius*, *Carthamus tinctoria*, *Lavandula spec.*, *Passiflora incarnata*, *Matricaria chamomilla*, *Coix lachryma*, *Datura metelloides*, *Rheum palmatum*, *Ricinus spec.*, twelve varieties of *Digitalis* and many others.

Most of the seed germinated in from one to two weeks and the method of handling the seedlings being much the same in each case, a description is here given of *Digitalis*.

After carefully preparing the soil which was of a good rich light moist loam containing a large amount of well-rotted sod and leaf mould, it was placed in

four or five-inch flower pots supplied with a few pieces of broken pot for drainage. The soil should be lightly pressed down so that the surface is smooth and quite firm. The seed were then spread over this prepared surface and covered with the same soil, to which about forty per cent. of sand had been added. The seeded pots thus prepared were thoroughly watered with a rubber bulb sprinkler which does not wash the soil. Each pot was covered with a plate of window glass to retain the moisture. In the preparation of the soil it is important to select that which is as free from weed seeds as possible.

*Digitalis lutea*, *Digitalis lanata*, *Digitalis grandiflora* and *Digitalis ferruginea gigantea* required from thirteen to fifteen days to come up, while *Digitalis purpurea rosea*, *Digitalis purpurea maculata superba*, *Digitalis purpurea gloxiniaeflora alba*, *Digitalis purpurea monstrosa* and *Digitalis purpurea alba* all germinated in from nine to thirteen days. In from two to three weeks the plantlets were well started having one or two pairs of leaves. At this time they were transplanted into flats (shallow boxes about three inches deep and preferably eighteen by twenty-four inches in area). The same rich finely pulverized soil was used here as in the planting of the seed. The plants were put about two inches apart each kind in a separate flat and the soil firmly pressed about the roots. When the plants became crowded in the flats they were transplanted into two and one-half or three-inch pots.

The next step was that of hardening off the plants before final planting. This was done by placing them outside in cold frames for the early part of May, glass being kept over them all the time for the first few days and then gradually withdrawn. The plots in the garden were worked over with a spading fork and the plants put in rows eighteen inches apart each way. About twelve hundred plants of the different species of *Digitalis* have been handled in the above described manner, the outside planting taking place from May 20 to June 20. The plants in the first beds put out have made a remarkable growth and the ground is covered with the beautiful rich green foliage.

In addition to the large number of plants started from seed, some plants were purchased, representing trees, shrubbery and hardy perennials from which drugs are obtained. The seed of over four hundred medicinal plants were imported and a large number of these are under cultivation, others are being put in as rapidly as the ground can be prepared.

A hedge of *Rhamnus catharticus* has been planted on the west and south sides of the garden. Within this are border beds filled with more or less tall growing annuals or perennials as *Inula helenium*, *Ricinus species*, *Hibiscus militaris*, *Borago officinalis*, *Atropa Belladonna*, *Martynia proboscidea*, *Datura stramonium* and *Helianthus annuus*. At the north end the border widens out into a broad plot which is filled with *Papaver somniferum*, *Salvia officinalis*, *Nicotiana tabacum*, *Salphiglossis*, *Canna*, *Thymus vulgaris*, *Lavendula vera* and others. At intervals of twenty feet along the border such trees as *Ulmus fulva*, *Xanthoxylum americanum*, *Juglans nigra*, *Salix alba*, *Quercus alba*, etc., have been planted. These outside beds are bordered with *Digitalis spec.*, *Cineraria maritima*, *Dianthus spec.*, *Impatiens balsamina* and *Antirrhinum majus*.

A large plot has been laid out at the south end of the slathouse and here may be found growing an interesting group of evergreens and other plants closely

related botanically as *Larix Europaea* and *Salisburia adiantifolia*, the Japanese Ginkgo tree. Between the trees a collection of the plants which yield our common pot herbs have been temporarily located, including *Ocimum Basilicum*, *Hyssopus officinalis*, *Melissa officinalis*, *Majoranum hortense*, *Origanum vulgare*, *Tanacetum vulgare*, etc. Along the south side of the slathouse various varieties of *Vitis vinifera* have been put in to afford additional shade. Between these *Citrullus Colocynthis* was planted.

The slathouse, a structure one hundred feet long, twenty feet wide and seven and one-half feet high, extends along the east side. A collection of shade loving plants have already been obtained, including *Cimicifuga racemosa*, *Podophyllum peltatum*, *Hydrastis canadensis*, *Geranium maculatum*, *Sanguinaria canadensis*, *Spigelia marilandica*, *Aspidium species*, *Cypripedium spec.*, and many others. A long bed is laid out along the front of the house and here different species of the following genera have been planted: *Luffa*, *Momordica*, *Citrullus*, *Convolvulus*, *Bryonia*, *Cucurbita* and *Cucumis*. In addition to these climbers such perennials as *Clematis*, *Humulus*, *Ampelopsis*, *Solanum*, *Wistaria*, *Aristolochia* and *Pueraria* species are to be found. The entire length of the bed is bordered with *Digitalis* species and there is also a fine display of *Cannabis gigantea*, *Cannabis Americana*, *Foeniculum vulgare* and *Zea Mays* varieties.

The largest portion of the garden is laid out into the rectangular plots previously referred to. Of these the following are deserving of special mention:

Plot No. 4 is planted to *Conium maculatum*. This plant has done remarkably well. Several of the specimens now in blossom have attained a height of over four feet.

Plot No. 6 contains *Ricinus communis* var. *minor* and var. *major* as well as a number of other species. The seed sold as drug appears too often to be a mixture of seed from the different species of *Ricinus*.

Plots Nos. 8, 12, 13, 16, 28, 48, 49, 61 and 62 are filled with different varieties and species of *Digitalis* and it is hoped that some work can soon be done concerning the factors which influence the potency of the official drug.

Plot No. 14 contains *Aconitum napellus*, *A. Lycotonum* and *A. Fischerii*, also *Delphinium staphisagria* and other species of *Delphinium*.

In plot No. 17 may be found *Capsicum frutescens* and other species of capsicum.

Plot No. 20.—*Sinapsis nigra* and *Sinapsis alba*.

Plot No. 24.—*Coriandrum sativum*, the drug purchased in the open market was used to plant this bed. The plants have made a fine growth and give promise of fruiting long before frost.

*Calendula officinalis* fills No. 25, a plant exceedingly easy of cultivation and producing a profuse number of flowers.

Plot No. 26 contains *Matricaria chamomilla*. This bed is now a mass of the beautiful little white daisies and, like calendula, is very easy to grow.

In plot No. 27 are twelve plants of *Datura metelloides*, which cover the entire 160 square feet devoted to them and present a magnificent sight in the evening when their large pure white odorous flowers expand.

*Nicotiana repanda* yielding Havana tobacco and *N. tabacum*, yielding the so-called Pennsylvania and other commercial varieties of tobacco, are growing luxuriantly in plot No. 30.

A fine group of *Atropa Belladonna* seedlings are found in plot No. 31, as well as a few flowering plants.

Plot No. 36 contains such xerophytic plants as *Aloe spec.*, *Agave Americana*, *Cactus grandiflora* and *Euphorbia pilulifera*, the border consisting of *Echeveria spec.*

Plots Nos. 39 and 56 are filled with such cereal yielding plants as *Avena Sativa*, *Hordcum sativum*, *Triticum sativum* and *Secale ccreale*.

Three varieties of *Hyoscyamus* are being studied, namely, *H. niger*, *H. albus* and *H. pictus*.

Several plots throughout the garden were assigned to drug yielding shrubs. Some fifty of these have been planted, including *Viburnum opulus* and other species, *Chionanthus Virginica*, *Hydrangea arborescens*, *Berberis vulgaris*, *Cornus stolonifera*, *Sambucus canadensis*, *S. nigra*, *S. pubens*, *Prunus serotina*, *Prunus Virginiana* and *Euonymus atropurpureus*. Between the shrubs hardy perennials have been planted, such as *Monarda* species, *Helenium autumnale*, *Iris spec.*, yielding *Orris*, *Phlox spec.*, *Paeonia officinalis*, *Yucca filamentosa*, etc.

On five of the plots cold frames covered with sash were constructed. Many plants were started in these and they will be used again this fall for giving slight protection to certain plants during the winter.

Over one-half of the medicinal plants yielding official drugs are already under cultivation and more are being continually added. Of those which do not yield official drugs the number is much larger and it is planned to add representative specimens as rapidly as possible of all drug yielding plants, some of which necessarily must be conserved in the greenhouse.

The general plan in developing the garden has been to keep different species of plants belonging to the same family in beds of close proximity. This was followed out to a certain extent, but until soil conditions can be produced as desired in each plot the plan will not be entirely feasible. Such an association of plants greatly enhances the value of the garden in giving instruction in pharmaceutical botany.

The effect of different soils, moistures, etc., on the constituents of certain plants is being carefully observed and it is hoped that some valuable pharmacophysiological work can soon be accomplished.

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#### PERMANENCE OF SOME ASTRINGENT PREPARATIONS.

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WILBUR L. SCOVILLE.

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In March, 1908, a series of fluidextracts of drugs which contain considerable amounts of tannin was prepared for the purpose of studying the stability of the tannin in such preparations. Each was freshly made and was tested as soon as possible after finishing.

The Loewenthal method of estimating tannin was first tried. With some the results were satisfactory, so far as the operation of this process is concerned, but with others it was impossible to get any end-point and this method was abandoned. From this and subsequent experiences the writer believes that no one method