

(c) Botanical family; (d) Part of plant official in medicine; (e) Brief historical sketch; (f) Reduced drawing showing representative portion of the whole living plant (in case it may be picked—see State Laws—draw the root or rhizome system also); (g) Drawing of the dried drug used in medicine (on return to the college).

V. Special credit may be assigned for students having the most carefully worked out field-trip notebook. All such books are returnable at the end of the course.

VI. Special reports on the plants encountered in the field, may be required by the instructor to improve habits of outside reading along the lines of the subject.

VII. The spot to be visited may be wooded land, field or even a botanical garden. It is best to visit virgin soil, a new spot to be selected during each of the trips. (The suggestive list of living drugs is too lengthy to include here.)

The results of such a series of field trips that may be expected are:

1. It associates for the student the name of the plant and its origin.
2. The student will better remember the part of the plant used in medicine.
3. Physical characteristics receive added emphasis.
4. Comparison before and after collection of the drug is afforded.
5. Presence of certain types of foreign matter are better understood.
6. The student is more apt to look into the historical background of a drug, since he is stimulated in this way.
7. This procedure builds up a better *cultural and scientific* background.
8. It enhances the general interest in the subject of Pharmacognosy.

FUNGAL INFESTATION OF POWDERED DRUGS.*

BY FANCHON HART.¹

The eight drug powders susceptible to mold infestation selected for these experiments were: Althaea, Capsicum, Cascara, Ginger, Licorice, Rhubarb, Mustard and Sarsaparilla. All were sterilized, moistened with sterile water and inoculated with *Aspergillus niger*, *Penicillium glaucum* and *Rhizopus nigricans*. I noted the rate of growth and the abundance of each organism on the drugs used as culture media. *Aspergillus* and *Rhizopus* grew most rapidly and abundantly on Althaea; *Penicillium* most abundantly on Mustard and most rapidly on Licorice.

Fruiting stages were developed on most substances used. The portions of the powders exhibiting the spores showed no physical change but the vegetative forms of the fungus manifested definite changes in the starches of the various drugs. The iodine-starch test showed that changes occurred through vegetative growth. The starch in contact with the hyphae was rose-pink to bluish rose in comparison with the characteristic blue color.

On Althaea *Rhizopus* appeared as a buff-colored leathery mat with fine hairy surface dotted with the black sporangia. The leathery surface was stretched.

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The substrate remained exceedingly moist but the color of the powder was altered from the light yellow to chocolate-brown.

A fine grayish buff tangled mass of hyphae superimposed upon the drug characterized the infested cascara culture. Sporangia were not abundant but appeared along the edges.

The growth upon the powdered Ginger was raised above the drug and appeared as a cobwebby veil removed from the surface of the powder. Few fruiting bodies appeared on the meshes as well as near the edges.

Capsicum was completely covered with a thick tangled mass of hyphae interspersed with the dark sporangia. The appearance was that of a dark chocolate-brown hair felt. The undersurface of the growth was thin, tough and homogeneous in texture.

The growth on Licorice was about six millimeters thick. The texture was uniform throughout, presenting a loosely matted cover on and above the drug. The color shaded from dirty brown to dark gray on the edge.

Rhubarb developed a Rhizopus growth which appeared as spun glass over the surface without any gross manifestation of sporangia.

The Mustard plate was covered with a parchment-like structure similar to the vellum of agaric. A thin layer of matted hyphae with sporangia was attached to the surface.

The sporangia appeared most prominently on Sarsaparilla. The hyphae formed a scanty but closely knit cover over the drug. The fruiting bodies appeared as minute, dry, dark brown discrete pellets arising from the hyphal film.

Penicillia took the form of tiny cushions, punctate on the surface, with an occasional pilose covering of white hyphae when grown on Althaea. The powder was slightly darkened but the fungus was devoid of any color when examined with a simple lens.

Capsicum presented tiny crateriform convolutions with occasional darker regions in concave portions.

Beautiful formations occurred on Cascara. Tiny chocolate-brown furrowed rods completely covered the surface.

Ginger produced a yellow-brown powdery fungal growth of fruiting Penicillia with only a suggestion of the presence of a vegetative stage in the form of short fibers.

The appearance of the fungal plant on Licorice was similar in texture to the growth on Ginger but varied in that the sporangia imparted an olive-green color to the surface of the drug.

A cartilaginous covering of closely-matted hyphae, light tan in color and dotted with dark green sporangia, occurred on the powdered Rhubarb.

Mustard gave rise to a light green irregularly elevated surface covered with sporangia. Superimposed upon these was a creamy white tomentose layer of downy hyphae.

Dark bluish black mottled surface distinguished the growth of Penicillium on Sarsaparilla.

The rapidly growing spores of *Aspergillus* soon covered the surface of Althaea. A red-brown dry granular growth overshadowed the few fine vegetative threads.

Capsicum manifested a brownish red finely punctate surface as a result of the fungal culture. A yellowish buff layer supported the sporangia. This substratum was thick but brittle to the touch.

The purplish brown tiny globular masses of sporangia completely covered the hyphal surface growth on Cascara. The vegetative portion of *Aspergillus* on this drug formed a thin but tenacious pellicle.

The Ginger culture appeared as an irregularly lobed structure. The entire powder formed into a thick layer. The upper surface, with abundant sporangia, was dark reddish brown in color, having a granular texture. The undersurface of the culture was moist and sticky.

Small, regularly punctate spherical bodies of a reddish brown color characterize this growth on Licorice. The culture is only slightly moist.

On Rhubarb this fungus is light brown in color, small, yellowish papillose elevations appearing on the surface.

The alliaceous odor prominent on the Mustard culture of *Aspergillus*, differentiates this growth from the other cultures on Mustard as a medium. A small number of sporangia were present.

Sarsaparilla developed a dry, dark brown powdery mass of sporangia. No hyphae were apparent on this drug.

It is my belief that the medicinal substances and particularly drug powders may be utilized to differentiate the cultural characteristics of the fungi.

The possible change in structure and composition brought about through mold contamination is at present under investigation.

A HISTOLOGICAL STUDY OF HORSERADISH ROOT AND SOME COMMON ADULTERANTS.*

BY DR. CHARLES W. BALLARD¹ AND FRANK J. POKORNY.¹

Horseradish Root (*Radicula Armoracia* L.) Rob. is a much-used condiment. Commercially, it occurs as the entire root, or it may be obtained in the grated and pickled condition. The authors recently had occasion to examine several samples of the grated root, purchased in the open market, and found that not all of the supposedly genuine roots were identical when seen under the compound microscope. Hence, a general study of the genuine Horseradish Root was initiated, along with certain other substances suspected as adulterants. These were the ordinary red beet, *Beta vulgaris* L.; turnip, *Brassica rapa* L.; and parsnip root, *Pastinaca sativa* L.

MORPHOLOGY OF HORSERADISH ROOT.

The genuine root occurs as a conical tap root, from one to two and a half feet in length, branched at the lower end; the roots sold commercially are usually one foot long and from one to two inches thick. The main root is cylindraceous, tapers very slightly and is divided at the apex into three or more crowns, or stem bases, bearing annular leaf scars. The summit of each branch may bear a number of young leaves, pale green, or nearly white in color. Externally, the root is of light

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