Squill.—One lot of ground drug showed numerous shining, transparent platelets of natural gypsum. However, the proportion present was less than 1% so that the strength was not materially affected.

Strontium Bromide, "Dried," Powdered.—Although invariably labelled "Dried" the materials were really only partially dried. Fully crystallized salt calculates to 69.6% anhydrous salt. The various lots examined contained 75.4, 76.5, 80.7, 85.4, 84.3, 77.1, 78.0, 76.6, 79.1 and 77.7% anhydrous salt. One lot labelled as "Dried" actually contained 99.7% crystallized salt (6 molecules water).

Strontium Peroxide.—One lot contained only 66.0% of Strontium Peroxide. The "N. N. R. 1924" required 84%.

Strontium Salicylate, U. S. P.—Is usually quite acid due to excess salicylic acid. One lot had acidity to phenolphthalein corresponding to 0.73% free salicylic acid.

Strychnine Arsenate.—Varies widely in composition. The 4 lots examined showed anhydrous strychnine alkaloid and total metallic arsenic as follows: 66.8 and 15.5; 70.5 and 21.62; 67.0 and 15.88 and 73.0 and 17.4%, respectively. A salt with 2 molecules of water calculates to 65.25% anhydrous Strychnine alkaloid and 14.64% total metallic arsenic.

Strychnine Hypophosphite.—Three lots examined assayed 73.3, 79.5 and 79.5%, respectively, of anhydrous Strychnine alkaloid. "P. W. R. Manual" gives 76.6% for 2 molecules of water.

Strychnine Phosphate.—Assayed 75.0% anhydrous Strychnine alkaloid and so conformed with 2 molecules of water which calculates to 71.37%.

Valerian, Powdered.—Two lots contained 20.8% and 16.2%, respectively, of acid-insoluble ash, and so failed to conform with the U. S. P. requirement of not more than 10%.

Zinc Bromide.—The three lots examined assayed 99.8, 97.5 and 98.3% anhydrous salt, respectively.

Zinc Oxide.—A lot of "U. S. P. Powdered" gave a bluish ferrocyanide test and so contained iron in excess of U. S. P. allowance but excess must have been small as the alkaline sulphide precipitate was white. This lot assayed 99.8% oxide, without igniting sample and was otherwise U. S. P.

Zinc Phosphide.—While in former years it was possible to obtain this material with phosphorus content around 22%, the various lots examined were much lower, *viz.:* 11.17, 11.1, 14.4, 13.9, 12.9, 13.8, 11.74 and 13.03%, respectively. "Mercks 1907 Index" gives Zn_3P_2 as formula. "P. W. R. Manual" gives 24.04% Phosphorus and "U. S. Dispensatory," 21st edition states "Theoretically each grain—contains nearly $^1/_4$ grain of Phosphorus."

Zinc Sulphocarbolate.—One lot was a solid lump the shape of container but excess moisture was not found as an assay of 99.3% salt with 8 molecules of water was obtained.

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EGYPTIAN PHARMACY.

The Indian and Eastern Druggist speaks of Egypt as a cosmopolitan country and it follows that in the larger cities such as Cairo, Alexandria and Port Said, there are English, French, Italian and Greek pharmacists, besides Egyptian, Syrian and Arabic.

A certificate to practice pharmacy in Egypt is granted if the diploma of the applicant is accepted by the Minister of the Interior. A pharmacist must be a graduate of a recognized school of pharmacy and also be prepared to pass a government examination as a test of proficiency. There are two certificates granted, one that of the "pharmacist," and the other "assistant pharmacist." The requirements for the "assistant pharmacist" are not so different from those in this country. The pharmacist does a great deal of chemical and bacteriological analysis and is in close coöperation with the medical profession. There seems to be a mutual regard by the members of the professions.

The Indian and Eastern Druggist also points out that there is considerable traffic in narcotic drugs. While in most instances this traffic is carried on by others than pharmacists there are a few who lend themselves to such business. The Narcotic law is quite stringent, but it seems to be a very difficult matter to make it effective. Quite recently trading in narcotics has been investigated.

RED-SQUILL POWDERS AS RATICIDES.

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Red-squill bulbs grow on the coast of Southern Italy, Sicily and Sardinia, and elsewhere along the Mediterranean Sea. They have been cultivated in this country. The bulbs are pear-shaped, usually from three to six inches in diameter, and weigh from 300 to 2000 grams. (Plate I.) They are composed of closely overlapping scales. The outer scales are dry, brittle and reddish brown in color;

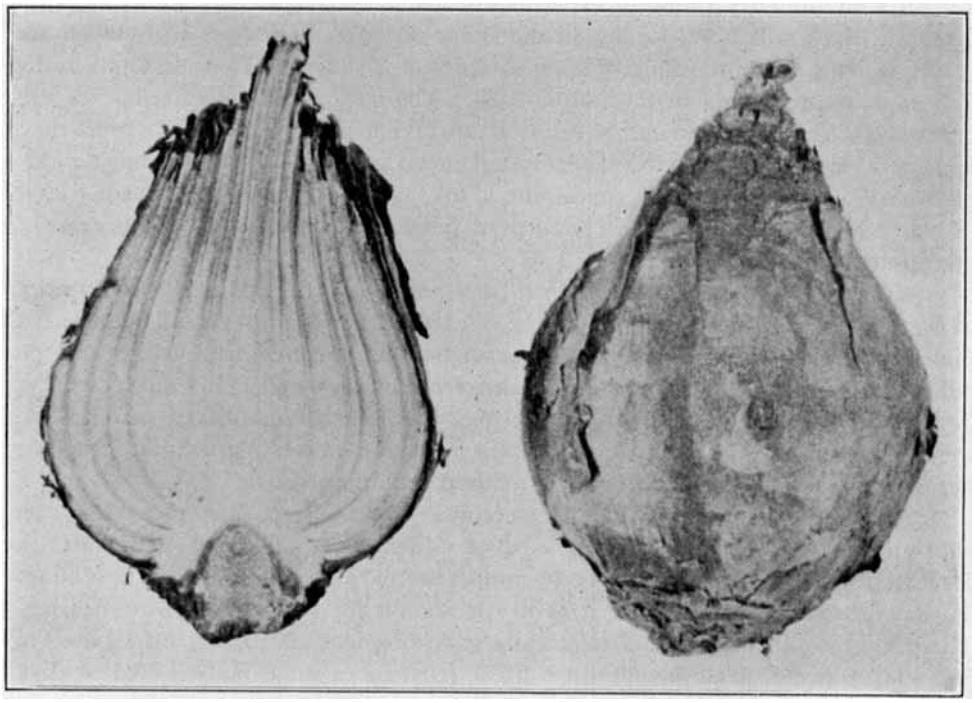

Plate I.—Red-squill bulb (*Urginia maritima*).

the inner scales vary from yellowish white to cherry or mahogany. White squill, which is official in various pharmacopœias and is used in medicine, does not kill rats.

A number of chemical investigations have been conducted upon red squill and four glucosides isolated, which are supposed to be the active principles. Raphides of calcium oxalate are responsible for the local irritant action of squill. In connection with these investigations, 75-gram portions of red-squill powder were extracted in Soxhlet thimbles with water, 95 per cent ethyl alcohol, acetone and chloroform until the extracts were colorless. The solutions were concentrated in a current of warm air, and the resulting solid extracts dried in an electric oven at 80° C. and finally in a vacuum desiccator over calcium chloride. The residues

were removed from the thimbles and dried at 80°. The extracts and residues were fed to rats to determine the toxicity. It was found that alcohol extracted one-third of the toxicity of the original powder; and that the toxic principle was not removed by water acetone or chloroform.

Another 75-gram portion of red-squill powder was exhausted by warming on a steam-bath with 800 cc. of water. Twice a day the solvent was removed in a Buchner funnel and a fresh charge of water added. After twenty-two days, extraction appeared complete. The aqueous solution was concentrated to a solid extract. The residue was a dark brown, tough sheet, heavily laden with glittering calcium-oxalate crystals. The extract and the residue were not toxic, showing that the active principle had been destroyed by this treatment.

In a preliminary series of experiments, twenty-four powders were prepared by O. F. Black and J. W. Kelley, of the Office of Drug, Poisonous and Oil Plants of the Bureau of Plant Industry from samples of a 900-pound keg of squill bulbs imported from Sardinia in the fall of 1923. The outer husks were removed, the bulbs sliced, dried in a current of air at a slowly increasing temperature until they appeared constant in weight, then ground in a drug mill to pass through a 40-mesh sieve. These powders, containing 1 to 2 per cent of moisture, were stored in closed vials. Some powders were prepared from single bulbs, others from a mixture of a number of bulbs.

A ton of squill bulbs was obtained from Sardinia in the fall of 1925 and stored at 4° to 5° C. until used. Bulbs were cut into slices one-half inch thick and dried in a commercial steam dryer. Slices one-quarter inch in thickness exuded a large quantity of mucilaginous juice, facilitating fermentation and materially retarding drying. In general, the bulbs contained 80 per cent of moisture. After these were dried, the residue was ground to pass through a 40-mesh sieve and packed in hermetically sealed containers or in pasteboard mailing tubes.

Powders made at 80° to 100° C. were more toxic than powders prepared from the same lot of original material dried at either lower or higher temperatures. Drying the chopped mixture directly in an electric oven gave as toxic a product as that obtained after allowing it to dry in the air for some time before heating. Three large squill bulbs dried separately gave powders killing white rats at 500, 500 and 2500 mg. per kilo; powders made from three small bulbs killed at 250, 250 and more than 5000 mg. per kilo. This shows the great variability of individual bulbs, and suggests that a number of bulbs should be mixed in the preparation of squill powder.

The bulbs having a light red or pink color were somewhat more toxic than those that were deep red. The difference in toxicity was so slight that it may be ignored in manufacturing squill powder on a large scale. Fermentation of a chopped composite to the stage at which the odor of alcohol was quite noticeable caused a loss of about two-thirds of the toxicity. Further fermentation to the stage at which the odor of acetic acid predominated caused the loss of one-third of the remaining potency.

In studying the effect of color, size, drying temperature and other conditions upon toxicity, experiments were conducted on a small scale using 100 to 200 grams of chopped squill bulbs. Based upon findings on this laboratory scale, experiments were conducted upon a semicommercial basis using 10 to 30 kilograms of

bulbs in each run. The chopped bulbs were placed in six trays (12 by 36 inches) in a dryer (25 by 60 by 80 inches) heated by closed steam coils. The temperature was kept constant within 4° or 5° C. during each run. The dried bulbs were mixed and ground in an electric mill to pass through a 40-mesh sieve. When a large lot of material was dried before fermentation had started, the same toxicity was obtained at a given temperature as in drying a small lot under laboratory conditions in an electric oven. Successive lots of material dried under essentially the same conditions gave products that were essentially identical in toxicity.

As a result of these investigations the following method for the preparation of toxic red-squill powder has been elaborated (1). It is possible that under manufacturing conditions variations in this procedure might not decrease the toxicity of the resultant product, but that question can be solved only by extended investigations under commercial conditions.

"Remove the outer dry husks from fresh red-squill bulbs obtained as soon as feasible after digging, and slice the bulbs transversely into sections one-fourth to one-half inch thick. Place the sliced composite as soon as possible in a drying oven, which has been previously heated to 80° C., and dry to constant weight at that temperature. Grind the dried material so that it will pass through a 40-mesh sieve. Pack the powder in hermetically sealed containers."

For the uniform production of red squill suitable for use as a rat poison, feeding tests are necessary upon every lot. In our investigations white or wild (brown) rats were held in cages for about a week to make the experimental animals essentially uniform. Rats weighing between 150 and 250 grams were employed. No consistent difference was found in the susceptibility of male and female rats. Animals were not given food for 18 hours, although water was offered freely. The rats were then weighed and placed in separate cages. The ordinary laboratory rat food—a mixture of $^2/_3$ whole wheat flour and $^1/_3$ whole milk powder to which one per cent of salt had been added—was passed through a 40-mesh screen. The sample of squill to be fed was thoroughly mixed with this food so that approximately 1 per cent of the animal's weight would be fed in giving the desired dose of squill. The weighed squill-rat-food mixture was placed in a glass sponge cup and inserted in the cage. The time when these cups were offered was noted and frequent inspections were made to determine the time at which all food had been consumed. The dish was removed after about four hours and any uneaten food weighed. The day following the feeding of a squill bait, rats were returned to the regular laboratory diet but kept in individual cages for five days. All deaths occurring within five days in animals that had shown symptoms of squill poisoning (the most characteristic of which if a continued gyration on the long axis) were attributed to squill. Rats readily consumed baits containing as much as 40 per cent of squill powder. The presence of calcium oxalate raphides did not deter a starved rat from eating these baits. A number of animals were fed each dose. The quantity of squill producing death in all, or practically all, rats within five days was selected as the Minimum Lethal Dose. The Minimum Lethal Doses varied greatly according to the method of preparation. The most toxic powder made in this work had a Minimum Lethal Dose of 150 mg. per kilo. In general the lethal dose was about 250 mg. per kilo.

A number of previous experiments have shown that a hungry rat will consume

one per cent of its body weight of food within 15 to 20 minutes. If the minimum lethal dose of red-squill powder is 1000 milligrams per kilogram and a bait is prepared containing 10 per cent of squill, the consumption of 1 per cent of its body weight will cause death. In case the lethal dose is less than 1000 milligrams per kilogram, a corresponding decrease in squill content may be made. It is suggested that squill baits be prepared and used at this uniform toxicity. Tests have shown that wild rats and white rats show practically identical sensitivity to squill. The average weight of the wild rats used in this investigation was 30 grams (10 ounces). Such a rat would require 3 grains, or $^1/_{10}$ ounce, of this standard squill bait. In these investigations rats were found to eat several times this quantity of food.

Cats, dogs, chickens, pigeons, pigs, woodchucks, prairie dogs and pocket-gophers refused to eat baits containing 10 per cent of squill powder (100,000 parts per million). Many cats refused to eat lean hashed meat containing 10 to 25 parts of squill powder per million, or consumed this food very slowly. When administered in gelatin capsules or by stomach tube, prompt and thorough emesis was produced. No other effect was noted. From these feeding and stomach-tube experiments, it was concluded that baits containing 5 to 10 per cent of squill powder either will not be eaten by animals other than rats or will produce emesis with direct removal of the bait.

CONCLUSIONS.

(1) A method of producing uniformly toxic red-squill powders has been developed.

(2) The usual lethal dose of these powders is approximately 250 milligrams per kilogram when fed to white or wild rats.

(3) No serious injury to pigs, cats, dogs, chickens, pigeons or other domestic animals should be anticipated when red-squill baits are exposed to kill rats.

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THE LEAF OILS OF WASHINGTON CONIFERS: I. INTRODUCTION.*

BY ARNOLD J. LEHMAN AND E. V. LYNN.

Very few volatile oils from the leaves of conifers growing in the state of Washington have been examined completely. Of oils from the twenty or more species, five have been studied more or less thoroughly but, in order to give us complete knowledge of the composition, much more work needs to be done. Four other oils have been prepared and their common constants determined, although little is known of the constituents. No attempt has been made to prepare oils from the other species, which present, therefore, a virgin field for the phytochemist.

It seemed desirable and interesting to prepare and investigate all of these oils in a systematic manner. The use in industry and medicine of various "pine oils" is well known. Some of these are known to possess peculiar properties which fit them for the applications made, but in most of them the composition, properties

* Scientific Section, A. PH. A., Rapid City meeting, 1929. No discussion.