AGRICULTURE

Uncle Sam Grows Rubber

Roots, stems and leaves of many plants native to the U. S. are possible rubber sources. Most promising, however, are the Russian dandelion and Mexican guayule.

By MARTHA G. MORROW

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➤ RUBBER is already being harvested from plants growing in Uncle Sam's own back yard. The leaves, stems, roots and other parts of numerous plants native to the U. S. or which can be grown here easily are being investigated as a possible source of emergency rubber.

Goldenrod, milkweed, rabbit brush and the Madagascar rubber vine are among the many plants which have been considered from time to time. The two most promising plants, however, are kok-saghyz, popularly known as the Russian dandelion, and guayule, native to northern Mexico and already growing in border sections of the United States.

MAKE RUBBER—Guayule plants such as these grow during the wet season, and rubber is formed during the dry season, when little growth occurs. The picture on the cover of this SCIENCE NEWS LETTER shows guayule seed at the Forest Service nurseries in California being covered with a thin layer of sand to keep it from blowing away.

The long taproot of the kok-saghyz, a domesticated relative of the familiar dandelion which creeps into our gardens and lawns, contains most of the rubber-bearing latex. The latex can also be seen oozing from flower stems or leaf midribs that have been cut. When the dried roots are broken, long elastic strands of rubber can be seen stretching between the broken ends.

Easy to Extract

Rubber from the kok-saghyz root is of a good grade, being about intermediate between that obtained from the guayule plant and from the tropical Hevea rubber tree, the source of most of our commercial rubber in the past. It is comparatively easy to extract rubber from the roots as they can be ground and the rubber floated off. The great merit of the dandelion lies in the fact that it can be harvested and the roots processed the same year that it is planted.

The kok-saghyz was developed by the Soviet government in an effort to overcome the lack of a domestic source of natural rubber. A number of expeditions were sent out by the Soviet government a decade or two ago to collect all plants showing signs of being potential sources of rubber, and several hundred types of plants were investigated. A little-known dandelion was finally selected as showing the most promise. It was named kok-saghyz, meaning "chew root."

The plant was cultivated and improved, and the U. S. S. R. built up quite a kok-saghyz rubber-producing industry. At present about 200,000 acres or more are reported to be under cultivation.

First Shipment in 1942

A number of unsuccessful attempts were made by the United States Department of Agriculture during the last decade to get kok-saghyz seed, then still very much in the experimental stage. Early in 1942, however, the Department of State and the Soviet Ambassador, Maxim Litvinoff, were instrumental in clearing the way for the first shipment. Other shipments followed, so that scientists in the United States, Canada and South America could begin to experiment with the rubber-growing plant.

RUSSIAN DANDELION—Rubber is contained in the long taproot of these kok-saghyz plants, which are being investigated by the Bureau of Plant Industry, Soil and Agricultural Engineering of the U. S. Department of Agriculture as an emergency source of rubber.

The Russian dandelion is definitely a cool-climate plant. It is suited for winter growth in the South and for summer growth in the northern tier of states from Vermont to Oregon. In less than nine months after planting the roots can be harvested for rubber.

Experimental plots here in the States have yielded up to 7,900 pounds of green roots per acre, but the yield averages between 4,000 and 5,000 pounds. Three-fourths of the weight of the roots is lost in drying, and their average rubber content is 4½%. Thus between 50 and 60 pounds of rubber can usually be harvested per acre.

Although the rubber contained within the roots averages only 4½% of the dry weight of the plant, some roots have been found to contain 12 to 22% rub-

ber. By proper selection and breeding it may therefore be possible to produce kok-saghyz plants which yield between 300 and 400 pounds of rubber an acre. The project is still in the experimental stage.

A number of difficulties have been encountered in raising kok-saghyz plants. The seed is small and unless treated, germinates slowly and unevenly. The plants grow slowly during the first few months and the weeds tend to crowd them out. This makes them expensive to cultivate. In selecting the best soil for planting, consideration must be given not only to the ease with which the plants flourish, but also to the difficulty encountered in digging them up.

The guayule plant is already well known in some localities as a source of rubber. Approximately 393 long tons of rubber were harvested last year from shrubs grown in the states, and in Mexico 7,000 tons were produced from wild plants.

Biologically Different

Rubber is contained not only in the roots of the guayule plant, but in the stems as well. Biologically it differs from other plants in that the rubber is produced in separate cells. In the kok-saghyz bush, Para rubber tree and others there are connected tubes or elongated cells to contain the rubber.

Guayule grows well in Texas, New Mexico, Arizona and southern California. The seeds are grown first in nursery beds, then transplanted into the field. One of the worst problems has always been in weeding, which used to be done by hand. Within the last year an oil spray has been developed which kills the plant's competitors for a place in the sun, but leaves the guayule unharmed.

The optimum yield is not obtained from the plant until it is four to seven years old. The end of the second year is the earliest that rubber extraction is practicable. It can be harvested at any season, however, which is a decided advantage. From 1,600 to 2,000 pounds of rubber per acre can be gotten from plants which are four or five years old.

Wet Season Shrub

The shrub grows during the rainy season, then the rubber is formed during the dry season when little growth occurs. In cultivating the plant, regions must be selected where there is enough rain to make it grow well, but where this is followed by a dry period sufficiently long for the plant to form a good supply of rubber.

The pebble-mill process is the conventional way of extracting rubber from guayule. This is the same used in extracting rubber from kok-saghyz. The whole shrub, having first been dried to solidify the small particles of rubber, is ground up under water.

Small "worms" of rubber mixed with the natural resin of the plant rise to the surface, but the wood fibers sink to the bottom. Dirt, picked up by the sticky resin, makes the product inferior to other types of natural rubber.

A new method of milling rubber from guayule has recently been devised. Here the plant is ground under water while still green, before the small particles of rubber sap harden. The rubber diffuses into the water and is removed in an ordinary cream separator. It comes off as a white liquid, being just slightly yellower than the liquid latex of tree rubber.

Rubber may be extracted from the Madagascar rubber vine, botanically known as *Cryptostegia grandiflora,* by bleeding the stems. The plants, which are grown for their handsome foliage and flowers in many parts of Florida, can be bled for *(Turn to next page)*

Do You Know?

California claims 270 species and subspecies of native *rodents.*

Lard is now used to coat frozen meat to prevent its drying in storage.

There are over 70 non-food industrial uses for *sugar;* sugar is used even in welding.

Nylon outlasts natural pig bristle three to one, resists solvents, is not attacked by rats, mice or moths.

Tobacco was once used by native Indians in Middle America as a medicine and also as incense in their religious ceremonies.

The federal government maintains 99 *fish hatcheries,* producing each year between six and seven billion fish to stock American waters.

A *camera* that takes pictures in one-millionth of a second is used in studying what happens in the instantaneous flash when a high explosive detonates.

Fluorochemistry, a new term, embraces the theory and use of fluorescence, phosphorescence and radiation; it concerns itself with the emission of light, both visible and invisible.

The *electronic heating* process can be used to dehydrate compressed foods without case-hardening or burning the product; the time required is but one-tenth of ordinary oven dehydration.

The *horse family* is supposed to have evolved in North America and migrated via Alaska to Asia 3,000,000 years ago; there the true horse developed, backtracked to America 1,000,000 years ago and became extinct in past ages.

When war suspended amateur *radio* activities in 1941 and put "ham" stations off the air, there were some 60,000 amateur operators of both sexes and all ages in the United States; 25,000 of them are now in war service.

Periodical *mackerel* scarcity off the northeast American coast is due to unusual winds that create currents which take the baby mackerel out to sea, or to unexplained shortages of the microscopic surface animals and plants eaten by them.

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rubber as often as every other day. The rubber is of an excellent grade, but 4,000 to 5,000 stems would probably have to be cut to get a pound of the latex.

Goldenrod, which brightens hills and fields almost everywhere in the fall, showed the most promise of rubber content in tests conducted by the late Thomas A. Edison of species native to the United States. Here it is the leaf of the plant which contains the rubber. Up to the present time, however, it has not been practical to produce rubber of a quality acceptable to the American market. The tensile strength and resistance to abrasion are far below that of Hevea rubber.

The Allies urgently need rubber for war and civilian uses. Large factories located at strategic points within the United States are turning out vast quantities of synthetic rubber to help meet that need. But natural rubber alone can perform specific duties and enables synthetic rubbers to satisfactorily perform a number of additional tasks.

The amount we can obtain from plants grown within the states is infinitesimal in contrast with the supply of natural rubber we received before the war, but in an emergency every little bit helps.

If you would like to have seeds of the guayule and kok-saghyz plants and be able to grow some of your own, you can secure the Rubber Plants Unit of THINGS of Science, a kit prepared by Science Service, by sending 50 cents to SCIENCE NEWS LETTER, 1719 N. St., N.W., Washington 6, D. C., and asking for unit No. 42.

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MINERALOGY

Huge U.S. Diamond

➤ THE FINDING of the largest diamond ever unearthed in the eastern United States was announced at the annual meeting of the Virginia Academy of Science in Richmond, Va., by Dr. Roy J. Holden, head of the geology department of the Virginia Polytechnic Institute. It was found at Peterstown, West Virginia, by William P. Jones of that town, and has been named the Punch Jones diamond. Dr. Holden presented a technical description of the stone based on his laboratory studies.

This diamond, a third larger than the largest ever found in eastern United States and the second largest ever found anywhere in America, weighs 34.46 carats, or 6.892 grams, he reported. It is hard enough so that a corner of the crystal readily scratches sapphire and a crystal face of carborundum. Its high refractive power is indicated by the brilliance and distribution of light transmitted by it.

In form the crystal is a hexoctahedron with all 48 faces present. The faces are not bright and shining but have a rather dull luster somewhat like ground glass.

No other diamonds have ever been found in the immediate vicinity of Peterstown. This small West Virginia Appalachian mountain town is close to the Virginia line, about 25 miles from Blacksburg, the site of the Polytechnic Institute, where this crystal was studied.

The theory advanced by Dr. Holden is that this diamond was brought to the discovery site many years ago by river wash from metamorphic rock formations well above the place where it was discovered.

The precious stone was actually found more than 12 years ago. Its value, however, was not recognized. It was carefully preserved merely because of its unusual appearance.

The finding was accidental. Young Jones, one of a family of 16 children, all boys, was pitching horseshoes with his father in a vacant lot owned by the family. The diamond was unearthed in one of the cavities gouged out by the horseshoes. It was sent to the college for examination about a year ago. Its existence has been a secret until now.

The widespread distribution of diamonds in the Appalachian region has not been fully explained, Dr. Holden stated. They have been found in an area 600 miles long and 200 miles wide, extending into eight states. They have been found in 26 localities, most of them in North Carolina and Georgia.

Diamonds are found also in California, the North Central states and in Arkansas. The California stones have been found in gold washings. The Arkansas findings are associated with peridotite dikes, and have their origin in that rock. The first Arkansas diamonds were found in 1906.

Since 1906, according to a scientist of the U. S. Bureau of Mines, approximately 50,000 diamonds have been found in Arkansas. Their average weight is a little less than a carat. Among them,