

# Jojoba wax extraction and bleaching

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**T**he quantities of jojoba seed available at present for extraction are too small to be handled by existing commercial oil seed processing plants, most of which have capacities exceeding 50 tons of seed per day. Instead, small mechanical presses or solvent extractors are being used. Following is a summary of experience we have gained on jojoba wax extraction to date.

## Jojoba seed

Jojoba seed harvested from wild populations in California ranges from 0.2 to 1.5 grams per seed in weight and from 44 to 56 percent in wax content. At maturity the hulls enveloping the seed turn from green to brown, shrivel, split, and release the seed, which drops to the ground. A small proportion of mature seed dehisces from the maternal plant with the hulls on and drops to the ground, still enveloped by them.

At times the seed is picked green from the plants by hand before complete development; in this case the hulls adhere to the seed. If this hand-harvest is done 20 days before maturity, the fruit (i.e., seed plus hulls) harvested may have as much as 45 percent moisture. Upon drying, the hulls make up 50 percent of the dry weight of the fruit.

Processors prefer to see the hulls removed from the seed before extraction, because they darken the color of the liquid wax, and because they interfere with its filtration. This is especially true if seed harvested green is improperly stored and allowed to mold. Hulls contain, on a moisture-free basis, 58.3 percent carbohydrates and 16.2 percent crude protein, and they may find uses in animal feeding.

Jojoba seed with less than 9 percent moisture may be stored for extended periods of time; seed viability declines, but the wax quality remains unaltered. This was verified following analyses of several 20- to 25-year-old seed samples. Jojoba wax may be extracted by mechanical pressure, by solvent extraction, or by a combination of both.

## Wax extraction by mechanical pressure

The following steps were followed in extracting jojoba wax with a Rose-downs and Thompson LTD. screw press.

1. Freeze the seed for 24 hours at  $-15^{\circ}\text{F}$  and then grind it with a hammer-mill fitted with a 3/16-inch screen.

2. See that lining bars are properly spaced as recommended; i.e., 0.025 inch, 0.015 inch, and 0.010 inch, starting from the meal introduction end of the press.

3. Turn on agitator in the hopper and fill hopper with ground seed.

4. Turn on steam to heat the ground seed in the hopper and the auger and lining bar assembly.

5. Maintain press temperature between  $180^{\circ}$  and  $190^{\circ}\text{F}$ , and moisture in the meal at about 10 percent. If the temperature is allowed to rise above  $190^{\circ}\text{F}$ , all moisture is evaporated, and the meal becomes too dry and plugs up the cage of the press.

6. Open the discharge orifice to its maximum size by screwing the choke sleeve all the way into the main body of the press.

7. Start the expeller.

8. When the cake starts to come out of the discharge orifice, gradually reduce the discharge orifice opening until the ammeter shows 7 to 10 amperes per hour.

Highest extraction efficiency is achieved when the seed temperature ranges between  $185^{\circ}$  and  $190^{\circ}\text{F}$  and the moisture content of the meal between 4 and 5 percent.

When fully developed, dry seed was extracted, mechanical extraction yielded 33 percent wax. This yield was maintained throughout the extraction of 16,000 pounds of seed.

## Solvent extraction

■ Seed. The seed was ground to 1/8-inch particle size with a hammermill and then fed to a countercurrent hexane extractor. Solvent extraction yielded 38

percent wax.

■ Meal. The meal obtained from the screw press extraction contained 18 percent wax. After solvent extraction of this meal, the overall quantity of wax obtained from both extractions rose to 48 percent of the original weight of the seed.

In the fall of 1976, a large quantity of jojoba seed spread out on the ground was rained on. The rains continued intermittently for about 6 days, and the earliest that the seed could be placed in a drier was on the 8th day after the first rain started. At that time germination had already started and about 30 percent of the seed had radicles up to 1 inch in length. The seed was dried again and extracted with the same screw-type press mentioned earlier. Wax yield of that seed dropped to 20 percent; the quality of the wax, however, had not changed to any measurable degree.

Clean the equipment extremely carefully before extraction, to remove any contaminants remaining on the equipment from previous extractions of other seeds. Jojoba wax stains and picks up odors very easily.

## Jojoba wax bleaching

Natural jojoba wax is yellowish in color and has a light "nutty" odor. Certain applications may call for the removal of both the color and odor of the wax. One efficient method of accomplishing both objectives at room temperature is to: (1) filter the wax through a column packed with silicic acid powder at the lower end; (2) pour the filtrate in a glass container, add magnesium silicate powder, and stir vigorously for 20 minutes; (3) filter the wax through Whatman no. 1 filter paper. The filtered wax is water clear and odorless.

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