SUMMARY

This search studied the wood properties in three woody plants growing in Antoniadis Botanical Gardens in Alexandria City (*Jatropha curcas* L., *Moringa oleifera* Lam. and *Phytolacca dioica* L.). In Egypt the studies on these plants are very limited. This work is a starting effort to characterize the wood properties of these species to determine their best uses. Therefore the objectives of this study are to:

- determine the variation of the specific gravity (SG) of *J. curcas*, *M. oleifera* and *P. dioica* woods and study the effect of stem height, distance from pith and wood nature on SG.
- analyze the chemical components (cellulose, hemicelluloses and lignin) and extractive contents of wood and bark.
- measure the fiber morphology (fiber length, cell wall thickness and lumen diameter).
- study the anatomical features among cross, radial and tangential sections of stem's wood in the three species.

A branch - free from any visible defects - was cut from each species. Five cross sectional disks (each disk ⁎ is 20 cm) were cut at five height levels in each branch of each species and then each disk ⁎ was cut into smaller disks; disk A (2.5 cm) for specific gravity study (disk A was cut into radial strip A), B (2.5 cm) for fiber length study (disk B was cut into radial strip B) and disk C (15 cm) for chemical properties study.

Specific gravity (SG) was determined by the maximum moisture content method. The chemical properties of wood and bark were characterized. Fiber morphology and wood anatomy were studied through cross, tangential and radial sections. Main results are as follows:

- The average values of specific gravity for the selected species are considered similar to those of light woods which have great industrial importance.
- Cellulose content of wood of *J. curcas* and *P. dioica* are 46.807% and 48.885%, respectively, while it is lower in *M. oleifera* (36.165%). On the other hand, the content of hemicelluloses in *M. oleifera* is significantly higher than that in both *J. curcas* and *P. dioica*. Lignin content in *P. dioica* is significantly lower than that in *J. curcas* and *M. oleifera*. Comparison of normal and tension woods for chemical components is not significantly different in the three species. *M. oleifera* is widely used in high grade paper industry.
- There are significantly high differences in hot water extractives, benzene-ethanol and 1% NaOH extractives among species. While, there is no significant difference in the same extractives between normal and tension wood. Wood extractives of *J. curcas* and *M. oleifera* have medicinal, antimicrobial and insecticidal importance. Generally, the bark in the studied species contains extractives for all types of solvents more than the wood of the same species.
- There are no significant differences of fiber length among different height levels and between normal and tension woods. Fiber length increases significantly near the bark especially in case of *M. oleifera* and *P. dioica*. The mean values of fiber length are 0.775 mm in *J. curcas*, 0.930 mm in *M. oleifera* and 0.906 mm in *P. dioica*. *M. oleifera* is used in papermaking. There are highly significant differences in fiber wall thickness and cell lumen diameter among the studied species. *P. dioica* has the greatest

wall thickness 2.180 µm, while *J. curcas* has the smallest (1.280 µm).

- Anatomical description of wood for each species is as follows:

1- *J. curcas*:

- Growth rings are distinct and the wood is diffuse porous.
- Vessels are arranged as isolates or as multiples in radial rows and they are oval or circular shaped in cross section. Perforations are simple and intervascular pits are multiseriate and in alternate arrangement.
- Longitudinal parenchyma are diffuse and some parenchyma cells are scanty paratracheal (touch the vessels).
- Fibers are septate (most common) or non septate.
- Uniseriate rays are the most common and they are heterogeneous with solitary crystals present in some ray cells

2- *M. oleifera*:

- Growth rings are indistinct and wood is diffuse porous.
- Vessels are arranged as isolates, pairs and triplets and they are oval or hemispheric shaped. Vessels have simple perforations and intervascular pits are rounded or oval shaped in cross section and they are in alternate and opposite arrangement.
- Longitudinal parenchyma are diffuse and some parenchyma cells are scanty paratracheal (touch the vessels).
- Fibers are libriform, non septate and in storied arrangement.
- Rays are closely in storied arrangement, uniseriate, biseriate, triseriate and heterogeneous.

3- *P. dioica*:

- There are successive growth rings (centric) representing the anomalous secondary growth. The rings are separated from each

other by conjunctive tissue containing raphids. Vascular bundles consists of phloem, cambium and xylem.

- Vessels are randomly distributed within the vascular bundle as isolates, pairs and triplets and they are rounded, oval, hemispheric and triangular shaped in cross section. Perforation plates are simple and intervascular pits are multiseriate and alternately arranged.
- Longitudinal parenchyma type is paratracheal scanty.
- Fibers are with rounded simple pits.
- Rays are obviously large, multiseriate and heterogeneous.