Vernonia oil is a naturally occurring epoxidized vegetable oil which contains predominantly (-80%) trivernolin, a triglyceride of vernolic acid (Figure 1). It has three epoxy rings per triglyceride molecule. In addition, it contains three carbon-carbon double bonds per triglyceride. There is one epoxy ring and one carbon-carbon double bond per each vernolic acid residue.

Vernonia galamensis, the source of vernonia oil, is a new potential

INTRODUCTION

Vernonia galamensis, the plant which produces vernonia oil, is at a developmental stage in several countries. Vernonia oil is a natural epoxidized vegetable oil containing three epoxy rings and three carbon-carbon double bonds. It has several advantages over other epoxidized vegetable oils produced industrially and appears to be a very attractive raw material for three large volume industrial applications. First, vernonia oil is characterized by very low viscosity (100 cps at 85°F) and low m.p. of about 36°F, with a potential as a reactive diluent for high solids alkyd, epoxy, and epoxy ester coating formulations by replacing conventional solvents. Second, vernonia oil can simultaneously improve the two major disadvantages of commercial epoxy resins: low toughness and high water absorption. Epoxy resins based on vernonia oil are elastomers at room temperature with a low glass transition temperature. Homogeneous mixtures of commercial epoxy resin, diamine, and vernonia oil form thermosets consisting of a rigid epoxy matrix with randomly distributed small rubbery "vernonia" spherical particles which dissipate part of the impact energy. Finally, vernonia oil appears to be a low-cost substitute of epoxidized soybean oil as a plasticizer and stabilizer of poly(vinyl chloride).
Figure 1. Molecular structure of triolein, vernonia oil, and epoxidized soybean oil.

TRIOLEIN:

CH$_3$(CH$_2$)$_7$.CH=CH.(CH$_2$)$_7$COOCH$_2$

CH$_3$(CH$_2$)$_7$.CH=CH.(CH$_2$)$_7$COOCH

CH$_3$(CH$_2$)$_7$.CH=CH.(CH$_2$)$_7$COOCH$_2$

VERNONIA OIL:

CH$_3$(CH$_2$)$_4$.CH=CH.CH$_2$.CH=CH.(CH$_2$)$_7$COOCH$_2$

CH$_3$(CH$_2$)$_4$.CH=CH.CH$_2$.CH=CH.(CH$_2$)$_7$COOCH

CH$_3$(CH$_2$)$_4$.CH=CH.CH$_2$.CH=CH.(CH$_2$)$_7$COOCH$_2$

EPOXIDIZED SOYBEAN OIL:

CH$_3$(CH$_2$)$_4$.CH=CH.CH$_2$.CH=CH.(CH$_2$)$_7$COOCH$_2$

CH$_3$(CH$_2$)$_4$.CH=CH.CH$_2$.CH=CH.(CH$_2$)$_7$COOCH

CH$_3$(CH$_2$)$_4$.CH=CH.CH$_2$.CH=CH.(CH$_2$)$_7$COOCH$_2$

"Vernonia" seeds contain about 42% of oil in contrast to soybean seeds, which contain only 17% oil. The maximum seed yield reached at this development stage of *Vernonia galamensis* is 2227 pounds per acre. Unfortunately, it has not been reproduced. Increased yield of vernonia oil, however, is expected by breeding as greater genetic diversity becomes available and by better management of the crop. The best soybean seed yield is 1926 pounds per acre (1979), which was the best soybean oil year.