A ROLE FOR GLYCEROL ADDITION TO WHEAT GERM FOR GROWTH OF INDIAN MEAL MOTHS

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In an earlier study (in press), the authors reported that wheat germ, supplemented with glycerol, was comparable to the standard rearing diet for supporting Indian meal moth growth. The nutritive value of dietary glycerol for larval growth was not clearly defined. The authors speculated that glycerol may effect an increase in the content of dietary water along with providing a source of usable energy.

The water content in wheat germ and other cereal products equilibrates with the water content in the surrounding air. Therefore, the moisture in a cereal diet can be regulated by adjusting the r.h. Adding a humectant (e.g. glycerol) augments the affect of r.h., nearly doubling the water content in wheat germ that contains 30 - 40% glycerol. The growth rates of Indian meal moth larvae on wheat germ were positively correlated with changes in dietary water content. The fastest larval growth rates (>6.0 mg/24 h) were observed with wheat germ/glycerol diets having water contents exceeding 24% (w/w).

The water content of the wheat germ diet was not augmented when glucose was substituted for all of the glycerol. Larval growth rates (ca. 3.0 mg/24h) on wheat germ/glucose were comparable to those on plain wheat germ. However, growth rates increased dramatically when relatively low levels of glycerol replaced some of the glucose and remained high over a broad range of glycerol/glucose combinations. Water contents in these diets were moderate, ranging under 24% (w/w). These results indicated that glycerol had a specific function in the growth of the larvae in addition to moisturizing the wheat germ diet. Both of these effects contributed to the acceleration of the growth rate.

The fastest increase in weight coincides with a developmental period when lipid synthesis and accumulation is most intense. We hypothesize that dietary glycerol provides precursors for fatty acid synthesis and promotes their incorporation into glycerides. In addition, glycerol augments dietary water which is needed to maintain a homeostatic balance in the tissues accumulating lipid. We conclude that the dramatic increase in growth rate during the last larval stadium when glycerol is added to wheat germ is the manifestation of an intensified synthesis and accumulation of fat and water in the larval tissues.