

### **Introduction:**

- Gossypol is a toxic substance contained in cotton plants.
- The amount of gossypol in whole cottonseed and cottonseed meal varies depending on the cotton species, growing season environmental conditions, and oil extraction process. It comes in two forms: a free, toxicologically active form and a protein-bound, inactive form (Robert S, 2007).
- Cottonseed is the most concentrated source, but may also be found in the hulls, leaves, and stems of cotton plant. There are two types of Gossypol: free and bound.
- Gossypol is a phenolic aldehyde that pervades cells and functions as a dehydrogenase enzyme inhibitor. Pigment glands in cotton stems, leaves, seeds, and flower buds contain gossypol, a phenolic compound.

### **Gossypol Chemistry:**

Gossypol is crystalline in nature, has a yellow pigment, is insoluble in water and hexane, soluble in acetone, chloroform, ether, and methyl-ethyl ketone (Butanone or MEK). Pigment glands contain gossypol and are identified as tiny black spots found in the cotton plant; seeds have the highest concentration (Nayanna Brunna S. Fonseca, 2014)



### **Gossypol Poisoning**

- Consumption of cottonseed products containing excessive free-gossypol causes gossypol poisoning, which presents as sub-acute to chronic, cumulative, and often insidious. Humans and domestic livestock, especially immature ruminants are the most vulnerable. Gossypol poisoning is related to and responsible for insult within the cardiovascular, hepatic, renal, and reproductive systems. For example: acute heart failure may occur as a result of cardiac necrosis after prolonged exposure.
- When fed in excess of the prescribed amount, gossypol can cause a temporary reduction in sperm cell formation. Some studies have suggested that there are toxicity-associated issues with fertility, while others have been unable to demonstrate any issues

### **Aim of the study:**

- The aim of the Thesis is:
- 1. Identifying the toxic hazards of gossypol in cottonseed.
- 2. Determine current knowledge of cotton farmers and gin operators on dangers of Gossypol.
- 3. Determine if farmers can be poisoned by handling gossypol for prolonged periods.
- 4. Determine evidence of gossypol poisoning of humans in other countries that rely on a more labor-intensive hand-processing of cotton via inhalation, ingestion or long time exposure (India, Africa, etc.).
- 5. Determine evidence of effects of gossypol on specific human populations (cotton farmers/gin operators/employees).

### **Method:**

#### **A. Solvent extraction of gossypol using acetone**

- 1. Twenty-five grams of crushed cottonseed will be weighed into a 500-mL flat-bottom flask with 250 mL of an extraction solvent.
- 2. Extraction solvents will consist of 80:20, 90:10, or 95:5 (v/v) acetone/water or 80:20, 90:10 with phosphoric acid added to give a 1.4 M solution.
- 3. A stir bar will be used in mixing. The flask will be fitted with a condenser, and the mixtures will be heated to reflux.
- 4. After the extraction period, flasks will be separated from the condensers and cooled to room temperature in an ice-water bath.
- 5. Each sample will be vacuum filtered over a Buchner funnel on #4 Whatman paper. After separation of the solvent, the retained meal will be washed on the Buchner funnel to eliminate the gossypol contained in the hold-up volume
- 6. The sample will be washed with 250 mL of the same solution used above but will be washed with an additional 250 mL of water.
- 7. After the wash treatments, the meals will be air dried under the hood.

