



## **Phytochemical Attributes Contributing to the Health-promoting Benefits of Mangos**

Cancer kills millions of people worldwide every year. While there are a variety of medical treatments for this disease, scientists recently have been more closely examining natural ways to help our body to fight off such a disease. Fresh fruits and vegetables have long been known to offer nutrients and disease-fighting properties that help to keep the body healthy, and research shows that consuming antioxidants and bioactive compounds found in produce can reduce the incidence of cancer and other diseases.

With this idea in mind, the National Mango Board commissioned a cell culture study to determine whether mangos possess properties that might help to reduce the incidence of cancer and other diseases. Drs. Stephen and Susanne Talcott of Texas A&M University, College Station, Texas, studied the antioxidants (namely polyphenols, which are cancer-fighting compounds derived from plant-based foods) in mangos to help determine how bioactive compounds from mangos are broken down and absorbed. Such compounds, which are ingested as part of the diet, help to protect normal body cells from being damaged. (Such damage may turn normal cells into mutated cells, which may turn into cancer cells.)

Researchers initially worked with several mango varieties – Francis, Kent, Ataulfo, Tommy Atkins and Haden – but narrowed the field to the two varieties that showed the highest number of total phenolics, Ataulfo and Haden. They also initially tested the activity of these mango antioxidants against several types of cancer cells: colon cancer, lung cancer, breast cancer, prostate cancer and leukemia in a controlled lab environment. Because the colon can absorb nutrients in two ways – from the bloodstream and from direct contact with the intestines – polyphenols are more likely to be absorbed in the colon than in other areas. (Cells in the lungs, breasts or prostate, for example, only have access to antioxidants through the bloodstream). Based on these initial findings, the researchers opted to focus their research on mango and colon cancer.

### **Overall Findings:**

1. **The Ataulfo mango variety was found to be the highest in total polyphenols, followed by Haden.** Researchers noted, however, that the antioxidant properties in mangos varied from fruit to fruit based on a number of factors like how mature the mango was when picked, where it was produced, and how it was ripened.
  - Riper mangos generally possess a higher number of phenolics, researchers say.
2. **At the highest doses, Ataulfo inhibited the growth of colon cancer cells by about 72%.** In fact, Ataulfo inhibited the growth of colon cancer cells without affecting the growth of normal colon cells.

- The effects of Kent, Francis and Tommy Atkins mangos on colon cancer cells were less than Ataulfo and Haden. In fact, the Tommy Atkins variety is more than 10 times *LESS* effective than Ataulfo.
3. **Mangos contain both large and small sized polyphenols.** The smaller phenolic compounds are readily absorbed into the bloodstream for use by the whole body. The larger compounds remain in the digestive tract, travel through the large intestines directly, and are available to cells only in the colon. This allows colon cells a higher exposure to the cancer-fighting polyphenolic compounds because they are metabolized in the intestines and thus directly available to the colon tissue.
    - Researchers found that mangos contain a large quantity of gallotannins, large antioxidant compounds. While large compounds often cannot be absorbed into the bloodstream, the benefit they offer to the colon is that they continue to travel through the digestive system where enzymes break them into smaller molecules. Researchers conducted some basic digestion trials using cultured cells to help determine how enzymes might break down the large gallotannin compounds in mangos. With enzyme action, gallotannins were broken down into smaller molecules of gallic acid and other smaller gallotannins. The body can potentially keep releasing more and more of these simpler antioxidants as they travel through the digestive system, Steve Talcott says.
  4. **The polyphenolic compounds in mango showed no negative effects on regular (non-cancer) colon cells.** Basically researchers found that mango cannot hurt colon cells, only help them.
  5. **Preliminary research shows genes affected by mango polyphenolics cause a suicide death of colon cancer cells, causing them to self destruct.** Ingesting the polyphenols in mango affects the division and growth of cancer cells.
  6. **Mangos contain moderate concentrations of carotenoids,** which are plant pigments with antioxidant properties. Researchers believe that the carotenoid compounds would have a much smaller effect than the Phenolics in terms of anticancer properties.

#### **Looking ahead:**

If further research is conducted and a positive relationship is found between mango consumption and reduced colon cancer risk, that research could be published and peer reviewed by the scientific community. Published research can then be made available to nutritionists and health-oriented editors who can share their interpretations of the research with consumers. Ultimately, if research suggests a positive relationship between mango consumption and reduced colon cancer risk, it could be used to strengthen the marketing position for mangos and increase consumer interest in the fruit.