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An Overview on the Healing Potentials of *Musa sapientm* (Banana) in the Treatment of Peptic Ulcer Disease

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Abstract

Gastric ulcer is a localized area of erosion in the stomach lining, resulting in abdominal pain, possible bleeding, and other gastrointestinal symptoms. The most common cause of gastric ulcer is Non-steroidal anti-inflammatory drugs (NSAIDs) and a stomach infection associated with the Helicobacter pylori (H. pylori) bacteria. The management of peptic ulcer disease and its complications remain a surgical challenge. Therefore, the evolution of newly discovered antiulcer drugs from medicinal plant is an attractive area, because several chemicals with anti-ulcer effect have been found in these plants, and they have shown a promising potential in the treatment of disease. Musa sapientum (Family: Musaceae), known as banana, is a familiar tropical fruit, is a treelike perennial herb that grows 5-9 m in height, with tuberous rhizome, hard, long pseudo-stem. The inflorescence is big with a reddish-brown bract, and it is eaten as vegetables, and the ripe fruits are sweet. Some studies reported that pectin and phosphatidylcholine in green banana strengthens the mucous-phospholipid layer that protects the gastric mucosa. Other studies highlight reported that leucocyanidin, a natural flavonoid from the unripe banana (Musa sapientum) pulp, protects the gastric mucosa from erosions.The present study is aim at reviewing the relevant studies on bioactive compounds in Musa sapientmwith their healing potentials in gastric ulcer diseases.
KEY WORDS: Musasapientum, gastric, ulcer, Helicobacter pyloriand leucocyanidin. Pathogenesis

INTRODUCTION

Ulcers are deep lesions penetrating through the entire thickness of the gastrointestinal tract (g.i.t) mucosa and muscularis mucosa. A peptic ulcer is a sore on the lining of the stomach or duodenum. The two most common types of peptic ulcer are called “gastric ulcers” and “duodenal ulcers” (Amandeep*et al.*, 2012). The pathogenesis of ulcers is multifactorial and includes diverse factors such as a stressful lifestyle, alcohol consumption, use of steroidal and nonsteroidal anti-inflammatory drugs (NSAIDs) and drugs which stimulate gastric acid and pepsin secretion, Helicobacter pylori infections, smoking, lower socioeconomic status and family history(Karpagam, *et al.*, 2011). The main therapeutic target is the control of gastric secretion using antacids, H2 receptor blockers like ranitidine, famotidine, anticholinergics like pirenzepine, telenzepine or proton pump blockers like omeprazole, lansoprazole, etc. The prevention or cure of peptic ulcers is one of the most challenging problem in medicine because gastric ulcer therapy faces drawbacks and most of the drugs currently available in the market show limited efficacy against gastric diseases and are often associated with severe side-effects.(Karpagam, *et al.*, 2011).

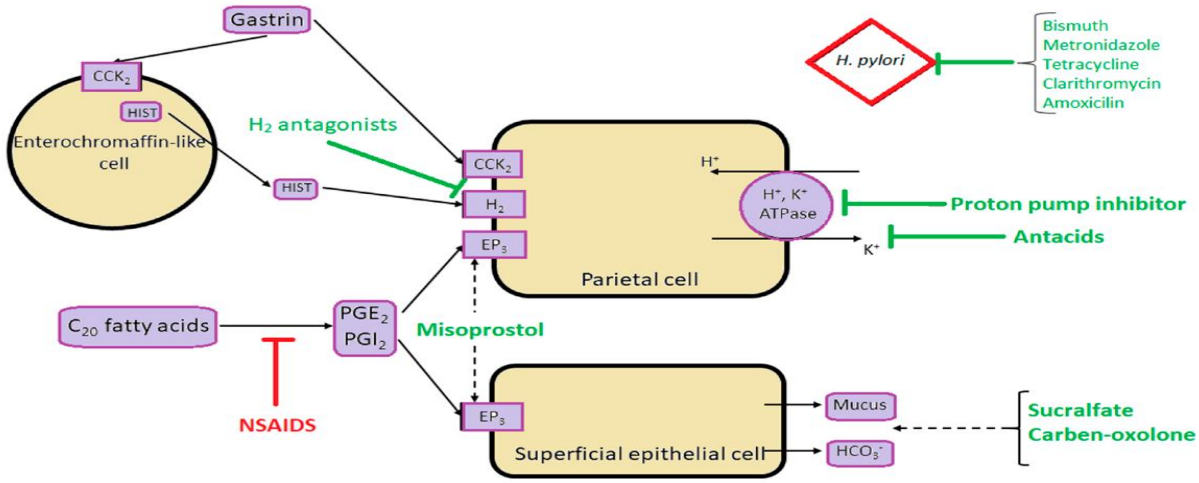
The development of new anti-ulcer drugs from medicinal plants is an attractive proposition, because diverse chemical compounds with anti-ulcer activities have been isolated from these plants, and they have shown to produce promising results in the treatment of gastric ulcers. The bioactive molecules (generally alkaloids, glycosides, lupeols, essential oils, e.t.c) isolated from crude extracts have been used directly as therapeutic agents or as starting materials for the synthesis of useful drugs or serve as a model for pharmacologically active compounds in the process of drugs in synthesis(Onasanwo, *et al.*, 2013).

Banana is used in the herbal medicine to treat peptic ulcer disease. The use of M. sapientum in peptic ulcer as a component of herbal medicine has been evaluated and found effective. Dunjić et al. (1993) reported that pectin and phosphatidylcholine in green banana strengthens the mucousphospholipid layer that protects the gastric mucosa.

They also reported that the gastric mucosa protective activity of the banana is due to multiple active components. Lewis et al. (1999) reported that a natural flavonoid from the unripe banana (M. sapientum var. paradisiaca) pulp, leucocyanidin, protects the gastric mucosa from erosions.(Imam and Akter, 2011)

PEPTIC ULCER

Peptic ulcer is a chronic disease affecting up to 10% of the world's population. The formation of peptic ulcers depends on the presence of gastric juice pH and the decrease in mucosal defenses. Non-steroidal anti-inflammatory drugs (NSAIDs) and Helicobacter pylori (H. pylori) infection are the two major factors disrupting the mucosal resistance to injury. Conventional treatments of peptic ulcers, such as proton pump inhibitors (PPIs) and histamine-2 (H2) receptor antagonists, have demonstrated adverse effects, relapses, and various drug interactions. On the other hand, medicinal plants and their chemical compounds are useful in the prevention and treatment of peptic ulcer(Kuna *et al.*, 2019).



(source: mdpi.com)

Figure 1 Schematic presentation of main pathophysiological mechanisms involved in the developmentof peptic ulcer disease, and the sites of action of the most commonly used pharmacological optionsin the treatment of peptic ulcer disease. CCK2 = Cholecystokinin Receptor; PGE2 = Prostaglandin E2;PGI2 = Prostaglandin I2; EP3 = Prostaglandin E receptor 3; HIST = Histamine.

TYPES OF PEPTIC ULCER

There are two different types of peptic ulcers. They are:

- Gastric ulcers, which form in the lining of the stomach and
- Duodenal ulcers, which form in the upper small intestine.

Both types of peptic ulcers are most commonly caused either by infection with *Helicobacter pylori* (*H. pylori*) bacteria or by frequent use of non-steroidal anti-inflammatory drugs (NSAIDs)

The symptoms of gastric ulcers and duodenal ulcers are similar, except for when pain occurs.

- Pain from a gastric ulcer often occurs when food is still in the stomach, shortly after eating.
- Pain from a duodenal ulcer often occurs when the stomach is empty, several hours after eating, and may improve after eating. Pain also may wake you in the middle of the night (Healthwise Staff, 2018)

Symptoms alone cannot be used to distinguish a gastric ulcer from a duodenal ulcer. Tests such as an endoscopy or an upper gastrointestinal (UGI) series may need to be used to find out the location of an ulcer. Gastric ulcers often heal more slowly than duodenal ulcers. A gastric ulcer that does not respond to treatment could be cancer. Your doctor will most likely recommend a biopsy of a gastric ulcer before beginning treatment. The biopsy will make sure there is no cancer hiding in the ulcer(Kuna *et al.*, 2019).

CHEMOTHERAPY OF ULCER

The major idea behind treating ulcers is to lower the amount of acid that the stomach makes, to neutralize the acid and to protect the injured area so it can have time to heal, Peptic ulcer therapy has undergone many strides over the past few years and a number of drugs are now available for treatment.

These drugs are broadly classified into two, those that decrease or counter acid pepsin secretion and those that afford cytoprotection by virtue of their effects on mucosal defensive factors. These drugs act by different mechanisms. Most of the commonly used drugs such as H2 - blockers (ranitidine, famotidine etc), M1 - blockers (pirenzepine, telenzepine etc), proton pump inhibitors (omeprazole, lansaprazole etc), decrease secretion of acid while, drugs like sucralfate and carbenoxolone promote mucosal defenses.(Goyal and Sairam, 2016)

The goals of anti-ulcer therapy therefore are, Relief of pain, Ulcer healing, Prevention of Complications and prevention of relapse. Anti-ulcer drugs are classified as,

1) Agents which help in reduction of gastric acid secretion,
2) Agents which neutralize the gastric acid,
3) Ulcer protective agents and
4) Anti-helicobacter pylori agents.

As *Helicobacter pylori* has been known as reason behind the pathogenesis of Ulcer, new treatment therapies are available for proper management of *Helicobacter pylori* induced ulcers. (Tripathy, 2014).

MUSA SAPIENTM (BANANA) AS A DRUG FOR TREATMENT OF PEPTIC ULCER

Banana is a tropical fruit grown in over 122 countries worldwide the cultivated area of 3.8 million hectares and a total production of 56.4 million metric tones of the fruit were produced ranking it fourth behind rice, corn and milk (Ehiowemwenguan, *et al* 2014). Musa sapientum is a treelike perennial herb that grows 5-9 m in height, with tuberous rhizome, hard, long pseudo-stem. The inflorescence is big with a reddish-brown bract, and it is eaten as vegetables, and the ripe fruits are sweet.Banana not only is delicious, but also has a lot of medical value. This fruit is made of water (75%), carbohydrate (23%), proteins (1%), fatty acids (0,3%) and alimentary fiber (2,3%) and their proportions can change according to the grade of maturation and species. Moreover, pulp contains lots of vitamins such as vitamin A, B2, B1, C, PP, B6 (it promotes protein's metabolism) and E, and it is full of minerals as calcium, phosphorus, iron and potassium (Tripathy, 2014).

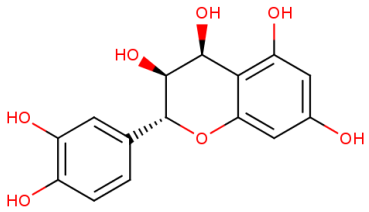
There are various types of species in Musa genusand their pharmacological studies have been studied.Plantain banana (Musa sapientum var. paradisiaca) has been shown to possess ulcer healing activity in man(Sahaa*et al*., 2013). Banana is one of the oldest and well-known fruit worldwide. The leaf and stem of banana are use to treat diarrhoea; the stem is good for asthenia and wounds, and the leaf for the treatment of inflammation, headache and rheumatism. Besides to its nutritional value, a number of biological activities studies have been carried out on banana and these studies prove it to possess bioactivities including anti-hyperglycaemic, antiulcerogenic, antioxidant, antihypertensive, cardiac depressant, diuretic, anti-tumoral, bronchodilatory, expectorant, oral contraceptive, abortifacient, antibacterial, antifungal and etc(Ado Ahmad, 2016).

Some studies reported that leucocyanidin, a natural flavonoid from the unripe banana (Musa sapientum) pulp, protects the gastric mucosa from erosions. Leucocyanidin and the synthetic analogues, hydroxyethylated leucocyanidin and tetra-allyl leucocyanidin were found to protect the gastric mucosa in aspirin-induced erosions in rat by increasing gastric mucus thickness.(Kumar *et al*., 2013)

In addition to what other studies provide evidence on anti-ulcerogenic activity of banana pulp powder inaspirin-, indomethacin-, phenylbutazone-, prednisolone-induced gastric ulcers, and cysteamine-and histamine-induced duodenal ulcers in rats and guinea-pigs, respectively.Furthermore, people from the South-Western Nigeria do blend the dried Musa sapientumpeels with the yam flour, which ;8is one of their stable foods. Folklore has it that this meal has ameliorative effect on the patients with gastric pain and ulcer(Imam and Akter, 2011).

The Leucocyanidin

The Leucocyanidin is a colorless chemical compound, belonging to the group of leucoantociani idrossiflavani, which is extracted from many plants including banana (Musa sapientum) pulp; increases capillary resistance , antagonizes the loss fraction of blood elements and normalizes capillary permeability. The active component leucocyanidin is responsible for the antiulcer properties of banana and protect the mucosa by stimulation of cell proliferation, promoting mucus secretion, increasing mucus resistance, inhibiting the Hcl secretion and thus healing the ulcer(Onasanwo, *et al*., 2013).



(source : en.wikipedia.org)
figure 2: Leucocyanidin

The mechanism of action

The mechanism of action of Musa sapientum is by stimulating the growth of the gastric mucosa by increasing mucosal protein i.e. sialic acid and hexosamine, which in turn increase the production of mucus and thus prevent erosion by the ulcer. These significant increased levels of sialic acid and hexosamine correlated with the increased mass of mucosa in the stomach of animals treated with banana. The mode of action of the banana appears to be unlike that of conventional anti-ulcerogenic drugs in that it promotes mucus secretion by stimulating the growth of mucosal cells. The regenerated mucosa cells would rapidly seal damaged areas with a secretory layer of mucus and prevent further erosions due to gastric HCl and pepsin(Karpagam *et al.*, 2011).

CONCLUSION

The exploration of natural products and medicinal plants extracts has become the most interesting and attractive sources of new therapy for various gastrointestinal disorders, especially in the treatment of peptic ulcers. Peptic ulcer disease remains a frequent clinical problem in our environment predominantly affecting all age of people.Chemotherapy has evolved to great extent and continues to do so with newer findings by the scientist across globe. No matter how much research is done to find an effective molecule, the chances of side effects or adverse effects cannot be ruled out. Thus, the prime focus on developing traditional medicines or herbal cure shall be carried out. There are lots of clinical developments happening across the globe. Therefore, banana has great potential in the management of ulcer. The presence of many active constituents like flavonoids, saponins, glycosides, alkaloids and components like Leucocyanidin in banana, having prominent anti-hyperglycemic, antioxidants and ulcer healing properties, may contribute in healing of peptic ulcer possibly by decreasing gastric mucosal cytokines, IL-1ß and TNF-α and enhancing, growth factor. Banana and its active constituents may emerge as more effective therapeutic agent to counter peptic ulcer incidence and ulcer healing.

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