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MULTIFARIOUS PHARMACOLOGICAL POTENTIALS OF PINEAPPLE PROTEASE (BROMELAIN): A MOMENTARY GAWK

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ABSTRACT

Bromelain is a crude extract from the fruit or stem of pineapple (*Ananas cosmosus* Linn.) plant that contains proteinases, which are good anti-inflammatory, anti-thrombotic and fibrinolytic properties. Among other components various closely related proteinases exhibiting actions such as inhibition of platelet aggregation, anti-cancer, mucolytic, skin debridement, digestive assistance, enhanced wound healing, cardiovascular and circulatory improvement, enhanced absorption of other drugs etc. Further, Bromelain also contains peroxidase, acid phosphatase, several protease inhibitors. It has earned universal acceptability as a phytotherapeutic drug because of its history of safe use and minimal side effects. This communication for review deals with the applications of bromelain in the treatment of various pathological conditions.

KEYWORDS: Bromelain, *Ananus cosmosus*, proteinases.

INTRODUCTION

Pineapple (*Ananas cosmosus* Linn.) eventually carried to Central and South America, is grown in several tropical and subtropical countries including India, China, Kenya, South Africa, Malaysia.[1] It has been used as a medicinal plant in several native cultures and bromelain has been chemically known since 1876.[2] It is present in all parts of the plants but stem is the most common source for the commercial preparation of bromelaine.[3] It was first introduced as therapeutic supplement in 1957, it is currently 13th most widely used herbal medicine in Germany. Although bromelain's primary constituent is a sulfhydryl proteolytic fraction, it also contains escharase (a non proteolytic components in bromelain thought to be important in the action of topical bromelain), peroxidase, acid phosphatase, protease inhibitor

and organically bound calcium.[4] It is a mixture of sulphur containing protein digesting enzymes. The popularity of pineapple is due to its sweet-sour taste containing 15% sugar, malic acid and citric fruit acids. It also contains vitamin B1, B2, B6 and C.[5] According to the estimation of FAO (UN) for the year 2003, Thailand, Philippines and Brazil are the top three producers along with India ranking forth in the world. Isolation and purification of bromelain can be achieved by several methods. The commercial preparation of bromelain is done by centrifugation, ultrafiltration and lyophilization. When some proteolytic fractions of bromelain are purified, they may be physiologically inactive *in vivo* under conditions where bromelain has a beneficial effect. It was found that a great deal of the physiological activity of bromelain may not be due to its proteolytic fraction.[6]

Bromelain and Anti-inflammatory and Analgesic activity

It is result from blocking bradykinin and its modulation of prostaglandin synthesis. It achieves an anticoagulant effect through both reduced platelet aggregation, by increasing relative concentration of prostacyclin and prostaglandin E2 over the concentration of thromboxane A2 and fibrinolysis by activation of plasmin. Plasmin further suppresses inflammation by blocking the mobilization of endogenous araachidonic acid by phospholipases.[7-11]

Bromelain and Anti-cancer activity

Several animal and human studies indicate that bromelain might have some anticanceractivity.[12-16] It is result from bromelain ability to affect T-cell activation, induce cytokinin production in circulating monocytes and enhances production of tumor necrosis factor and interleukins. As an adjunct in cancer therapy bromelain may act as immunomodulator by raising the impaired immunotoxicity of monocytes against tumor cells and by inducing the production of T-cells. 17Bromelain also inhibits the proliferation of different tumor cells in vitro. The inhibitory activity can be traced neither to the proteolytic nor to the or to the platelet aggregation- inhibitory activity.[18]

Bromelain and Anticoagulant and Fibrinolytic activity

The conclusive evidence that bromelain prevents aggreagation of blood platelets was reported.[19] Bromelain also inhibits platelet aggregation in a dose dependent manner in *in-vitro* study.[20] Bromelain also prevents thrombin induced human platelet aggregation and platelet adhesion to bovine endothelial cells. Furthermore, oral and intravenous application reduced thrombus formation in rat mesenteric vessels. [21-22]

Bromelain and Anti-helminthes activity

Infections with gastrointestinal nematodes have severe consequences. Plant cysteine proteinases from pineapple have high proteolytic activities that are known to digest nematode cuticle, have low toxicity and have been used in traditional medicines against gastrointestinal nematodes for decades.[23-25]

Bromelain and Wound healing activity

Bromelain contains more than 50 different components and is widely used as an over the counter food additives and is also used in debridement of burn eschar.[25,26] To exert debrideration action the concentration of enzyme must be 30-100 times higher than the pharmacological dose required for wound healing. They also show collagenolytic activity which is again promotes wound healing activity.[27] Topical bromelain (35% in lipid base) has achieved complete debridement on experimental burns in rat in about 2 days, as compared with collagenase, which required about 10 days, with no side effects or damage to adjacent burned tissue.[28-32]

CONCLUSION

This review describes pharmacological and phytochemical studies on Pineapple Protease (Bromelain) plant. Plants are widely used in traditional medicine system for curing number of pathological diseases. The large population resides in rural areas of developing and a developed country depends on medicinal plants. The present review revealed that Bromelain, crude extract of Pineapple Protease has great potential to treat cancer, helminthes and cardiac disorders. Further, anti-oxidant, anti-inflammatory, wound healing, anticoagulant, fibrinolytic and analgesic properties of crude extract of Bromelain opens a new vista towards more focused research on molecular mechanism of action involved in the treatment of various chronic disorders.

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