Antidiarrhoeal and Antimotility Activity of the Maize Silk (*Stigmas maydis*) Aqeous Extract

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Abstract

The antidiarrhoeal effects of the aqueous maize silk extract were evaluated in mice and rats *in-vivo*. The studies were carried out on Instestinal motility of or in mice and castor oil-induced diarrhoea in rats. Phytochemical screening of the aqueous extract of maize silk revealed the presence of tannins, flavonoids, steroids, saponins, resins, alkaline, carbohydrate and reducing sugars. The results also revealed that the extract (100, 200 and 400mg/kg) exhibited a dose dependant significant (P<0.001) decrease in intestinal motility in mice and markedly protected rats against castor oil-induced diarrhoea comparable to loperimde (5 mg/kg). The results showed that the aqueous extract of maize silk may contain some biologically active principles that may be active against diarrhoea and may be the basis for its use traditionally for gastro-intestinal disorders.

Keywords: Antidiarrhoeal, Antimotility, Maize silk aqueous extract.

Introduction

Maize silk is made up of the stigmas and the styles of the maize plant belonging to the grass (Poaceae) family (Renetal; 2009; Hu and Deng, 2011). Maize silk has been used for thousands of years as folk medicine in many parts of the world for the treatment of oedema as well as for cystitis, diarrhoea, kidney stones, nephritis diabetes mellitus and prostitis (Li and Yu, 2009; Hu et *al*., 2010). It has been found that maize silk is an excellent source of many bioactive compounds, such as flavonoids, saponins, alkaloids, tannins, phytosterols, vitamin E and K (Bushman, 2002).

Diarrhoea is common in the tropics. Indeed, in certain parts of the world, diarrhoea produces more illness and causes death of more infants and children than all other diseases combined (Abdullahi *et al.,* 2000). The use of herbal drugs in the treatment of diarrhoeal diseases is a common practice in many countries of Africa including Nigeria. This study was carried out to evaluate the potential antidarrhoeal effect of maize silk.

Materials and Methods

Maize silk (*Zea mays* L) was collected from the Livestock Investigation Division, NVRI, Vom, Maize Farm and identified by Mr. S. Y. Shwarpshakka, Plant taxonomist, FCAH&PT, NVRI, Vom. Fresh maize silk was collected, washed with distilled water and dried for 24h by using a hot air oven at 50^0C and powdered using a grinder and stored before use. Preparation of the Extract 200g of the powdered maize silk was packed into a thimble and sequentially extracted using hexane, ethylacetate, methanol and then water in a soxhlet apparatus. The various extracts were concentrated and the last traces of the solvent removed *in vacuo*. The water extract yield was 8.45% w/w and this was used for the studies.

Phytochemical Screening

The freshly prepared extract was subjected to a standard photochemical screening test

for various constituents (Trease and Evans, 1983).

ACUTE TOXICITY TEST

The median lethal dose (LD_{50}) was determined via a two phase approach as described by Lorke (1983).

Studies on Intestinal Motility in Mice

The animals were randomly divided into five groups (I, II, III, IV and V) of five mice each. These animals were starved for 24hrs prior to the experiment but were allowed free access to water. Mice in groups I were given 5ml/kg of distilled water i.p, group II, III and IV received the maize silk extract (100, 200 and 400mg/kg i.p) respectively. Group V mice were given 5mg/kg of loperamide. 5mins. after drug administration, 0.5ml of a 5% charcoal suspension in a 10% suspension of tragacanth powder was administered p.o to each mice.

All the mice were euthanized 40 mins. later in a gas chamber with chloroform, the abdomen opened and the distance travelled by charcoal plug from the pylorus to the caecum determined and expressed as percentage of the total length of the small intestine (Abdullahi *et al*, 2001; Okpara *et al*; 2007).

Studies on Castor oil-induced Diarrhoea in Rats

The rats were fasted for 12hrs prior to the commencement of the experiment and were randomly divided into five groups (I, II, III, IV and V) of five rats each. The rats in group I received 5ml/kg of distilled water p.o. while, those in groups II, III and IV received graded doses of the extract (100, 100 and 200mg/kg. The last group received 5mg/kg of loperamide. After 30min of drug treatment, castor oil (0.5ml/rat) was administered intragastrically. The rats were placed in individual cages over clean filter papers. 3h after oil-challenge, the rat cages were inspected by independent observers for the presence of characteristic diarrhoeal droppings. Their absence was recorded as effective protection from diarrhoea (Okpara *et al;* 2007).

Statistical Analysis

The results were expressed as mean ±SEM. The significance of difference between the means was determined by student-t-test and results regarded as significant when (P<0.05). The results on castor oil-induced diarrhoea were analyzed by the Chi-square test.

Results

Phytochemical Analysis

The extract showed positive result for saponins, tannins, flavonoids, alkaloids, resins, carbohydrates and reducing sugars.

Acute toxicity test

No death was recorded even at the highest dose of 10,000mg/kg p.o. Thus, the median lethal dose was not determined.

Table 1: Effect of the aqueous extract of maize silk (MS) on intestinal transit in mice.

Drug	Dose Mg/kg i.p.	Distance travelled by Charcoal Plug
D. W	5ml/kg	62.14±3.5
MS	100mg/kg	46.43±1.7[a]
MS	200mg/kg	41.24±1.8[a]
MS	400mg/kg	35.72±6.2[a]
Loperamide	5mg/kg	32.27±1.4[a]

(n=5, Mean ±SEM) Values are means ±SEM.

[a]*P*<0.001. All treatments were significantly different from distilled water (DW).

Table 2: Effect of the aqueous extract of maize silk (MS) on castor oil-induced diarrhoea in rats.

Treatment	**Dose mg/kg p.o.**	**No. Of rats with diarrhoea**	**Protection (%)**
D. W.	5ml/kg	5/5	0
MS	100mg/kg	1/8	80[a]
MS	200mg/kg	0/5	100[a]
MS	400mg/kg	0/5	100[a]
Loperamide	5mg/kg	0/5	100[a]

(n=5; Mean ±SEM) Values are means ±SEM

*P<0.001. All treatments were significantly different from distilled water. (DW)

Discussion

The aqueous extract of maize silk is very safe in the mice as no death was recorded at the highest dose of 10,000mg/kg (Lorke, 1983). The phytochemical screening test result is in line with earlier work by Bushman, (2002) who reported the presence of bioactive compounds, such as flavonoids, tannins, saponins, alkaloids, phytosterols etc in corn silk.

This study revealed that the aqueous extract of maize silk may contain substance (s) that possess significant antidiarrhoeal and antimotility properties. The extract significantly protected rats against diarrhoea evoked by castor oil as well as significantly decreasing the intestinal motility in mice. The effect of the extract is comparable to loperamide, which is at present one of the most efficacious and widely used antidiarhhoeal drug (Abdullahi *et al*, 2001; Okpara *et al*., 2007). Loperamide effectively antagonized diarrhoea-induced by castor oil (Abdullahi *et al.,* 2001; Okpara *et al.,* 2007), prostaglandins (Abdullahi *et al*., 2001), or cholera toxins (Okpara *et al*., 2007). The therapeutic effect of loperamide is believed to be due to its antimotility and antisceretory properties (Abdullahi *et al*; 2001, Okpara *et al*; 2012). From the studies it is likely that the extract of maize silk may mediate its effects through similar mechanism.

Though several constituents were present in the extract, flavonoids highly present have been demonstrated to inhibit contractions induced by spersmogens (Okpara, 2012), inhibit intestinal secretions and inhibit small intestinal transit (DiCarlo *et a*l., 1993; Abdullahi *et al.*, 2001; Okapra, 2012), properties as these may underlie the observed antidiarrhoeal and antimotility effects of maize silk.

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