Pharmacological study of Zea mays(corn silk)

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Abstract :

Plants are valued in the pharmaceutical sector for their huge variety in structural variations and pharmacological effects. Indigenous plants such as corn has been used for this study. Corn silk has long been seen as a waste product, but because of its many medicinal benefits, it has unexpectedly acquired popularity in Asian and African nations. Subsequently, the purpose of this work is to evaluate the phytochemical , anti mitotic and anti bacterial properties of methanolic extract of dried corn silk powder in order to figure out its bioactivity. LC-MS also been done to identify the probable phytoconstituents in extract.

Introduction:

A primary source of chemotherapeutic drugs for the prevention or treatment of various diseases involves plants and herbs (Zampini IC, 2009). The focus on herbal products in recent years has been a result of their ability to strengthen the immune system as well as their inhibitory effects on several diseases and microbes that impact both people and animals (Bhalodia NR, 2009).

Furthermore, it is feasible to investigate the applicability and advantages of native plant materials to mankind using cutting-edge scientific methodological approaches due to the growing demand for organic materials that serve as food additives, materials of functional foods, nutraceuticals, and plant disease prevention. (Abdel RS, 2011).For this study, indigenous plant *Zea mays* (silk)has been taken.

The long style and stigma of blooming corn or maize is called as corn silk. Before to pollination and maturity, they are thin and silky and range in color from light to dark brown. In different places around the globe, maize silk has been used to treat edema as well as cystitis, gout, kidney stones, nephritis, and prostatitis (Singh, 2022) .Proteins, vitamins, carbohydrates, calcium, potassium, magnesium, and sodium salts fixed and volatile oils, steroids like

stigmasterol and sitosterol, alkaloids, saponins, tannins, and flavonoids have been reported as to be found in it. (Jianyou G, 2009). Further , research on its various properties makes its promising candidate for developing medicinal drugs .

Materials and method:

The corn silk was collected from local shop in market. It was dried in an oven for two hours at 150 ºC. An electric grinder was used to create the powder.300 ml of 95% methanol and 100 g of maize silk powder were added, and the mixture was allowed to shake at 5000 rpm for 48 hours in an shaker incubator. After 48 hours this mixture was filtered by Whatman filter no. 1. Solvent extraction was done with slight changes to solvent usage described by De. Mesquita (De Mesquita, 2007).A rotary evaporator was used for drying the filtrate(Equitron, India). Methanolic extract of corn silk is obtained has been further used to analyse different activities.

Phytochemical tests:

the methanolic corn silk extract was tested to check presence of different phytochemicals using standard protocol. (Debiyi, 1978)

1. Test for flavonoids:

(A)alkaline reagent test:

Add 10% NaOH to plant sample, if yellow color persist, add drops pf diluted HCl, if yellow color vanish means test is positive.

(B) lead acetate test:

Few drops of 10% lead acetate solution added to 0.5 ml plant extract, if yellow color observed means test is positive.

2. Test for terpenoids:

(A)Salkowski test:

0.5 ml plant extract + 0.2 ml chloroform+0.3 ml concentrated H_2SO_4, if reddish brown color observed means test is positive.

3. Test for amino acids:

Biuret test:

0.5 ml plant extract +few drops of 2% copper sulphate solution and 1ml of ethanol with addition of excess of potassium hydroxide pellets, if pink color observed indicating test to be positive.

4. Test for cardiac glycosides:

killer killani test:

0.5 ml plant extract +0.08ml glacial acetic acid + 1-2 drops of $FeCl_3$ if brownish and greenish ring in interface observed mean test is positive.

5. Test for Saponins

Foam test:

0.5 ml of plant extract with few drops of ethanol. Shake after adding some distilled water . If stable foam is observed mean test is positive.

6. Test for Steroids

Libermann- Burchared test:

2 ml of Acetic Anhydride with 0.5 ml plant extract followed by 2 ml H_2SO, if color change from violet to blue or green is not observed indicates the presence of steroids.

7. Test for Tannins

Ferric chloride test: **Add 0.5 ml plant extract with few drops of 1% $Fecl_3$, intense green or black color means presence of tannins.**

8. Test for phenols:

(A)Ferric chloride test:

0.5ml plant extract with 3-4 drops of 5 % $Fecl_3$ solution., bluish color indicates the presence of phenols.

9. test for alkaloid:

(A)Mayer's test:

0.5ml plant extract with freshly prepared potassium – mercuric iodide solution (1.36 gm $HgCl_3$+ 5 gm KI)+ 100 ml water , if cream color precipitate is observed, means test is positive.

Anti – mitotic activity:

Meristematic cells from the A. cepa root were used to examine this activity. During 48 hours at room temperature, A.cepa were grown in tap water. For the experiment, the bulbs that had uniform roots were chosen(Fig. 2). As a control, water was utilized. Colchicine (1 mg/ml) served as the standard control. Methanolic corn silk extract (10mg/ml) was taken as test control and is performed in triplicate.The medium/vehicle dilution applied was water. Squash preparations were created by staining the treated roots with acetocarmine dye after the 24-hour treatment period. (Thenmozhi, 2011). Roots were observed under 10X magnification lens and no. of dividing and non- dividing cells were counted by mitotic index.

$$\text{Mitotic index (MI)} = \frac{\text{Number of dividing cells}}{\text{Total Number of cells}} \times 100$$

Water Standard

Z.,mays silk extract

Anti-bacterial activity:

Tested microorganisms:

Master plates of bacterial strains were obtained from Atmiya University, Rajkot. This includes two-gram positive strain (*Staphylococcus aureus, Bacillus subtilis)* and two-gram negative pathogenic strain (*Shigella flexneri, Salmonella typhi*).

Procedure:

A loopful of isolated colonies were inoculated into 100 ml nutrient broth, incubated for 24 hours at 37ºC .100 µl of this broth spreaded into N- agar plates(40gm/l). Antibacterial activity was carried out using Disc Diffusion Method. (Arya, Yadav, & Kumar, 2010) .The different concentration of 10mg/ml, 25mg /ml 50 mg/ml and 100mg/ ml of plant extract(100µl) were taken and added into wells made by sterile borer. The diameter of zone of inhibition was calculated in mm if observed. Rifampicin drug (15 µg) discs were taken as standard control. Master plates of respective strains were used as positive control.

Results:

Phytochemical test:

Phytochemical analysis showed the presence of phytoconstituents such as flavonoids, terpenoids, saponins, steroids, phenol, tannins, cardiac glycosides, amino acids and alkaloids.

No.	Phytoconstitute	Name of test	*Zea mays* extract
1	Flavonoids	Alkaline test	-
		Lead-acetate test	+
2	Terpenoids	**Salkowski test**	+
3	Saponins	**Foam test**	-
4	Steroids	**Libermann-burchared test**	+
5	Tannins	**Ferric chloride test**	+
6	Phenol	**Ferric chloride test**	-
7	Amino acid	**Biuret test**	+
8	Cardic glycoside	**Killer killani test**	+
9	alkaloids	**Mayer's test**	+

Antimitotic assay : microscopic observation

After staining the root tips were observed in 10x in light microscope. The images are as follows :

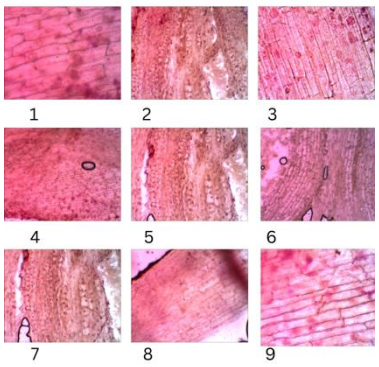


Fig.3 : 1-3(water), 4-6(plant), 7-9(plant extract)

The result of effect of Zea mays on mitotic index of allium sepa root tips cells are given in table

	Dividing cells	Non- dividing cells	Total	Mitotic index (%)
Plant sample-1	120	220	340	35.29%
Plant sample-2	132	196	328	40.24%
Plant sample -3	235	95	330	71.2%
Water -1	160	40	200	80%
Water-2	85	35	120	70.83%
Water- 3	115	35	150	76.67%
Standard-1	49	111	160	30%
Standard-2	35	150	185	18%
Standard-3	29	193	215	10%

Statistical analysis:

Statistical analysis was performed using Graphpad prism software. The graph showed comparative analysis of mitotic index of water, plant extract and standard . Extract of Z. mays. showed significant antimitotic activity. Colchicine (0.1 mg/mL) was used as a standard and shows highest antimitotic activity. P value of methanolic extract were calculated p = 0.0001 .Thus, plant displayed significant antimitotic activity which indicates its use as a potent antimitotic agent.

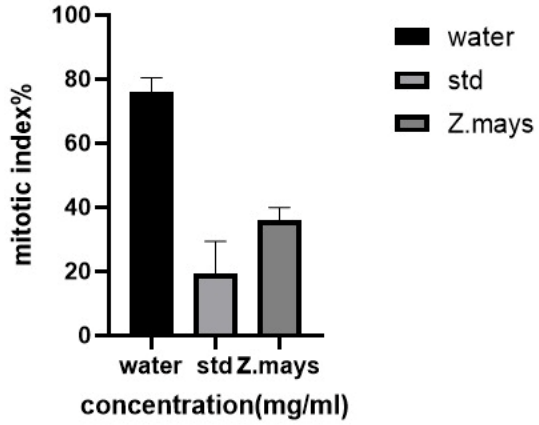
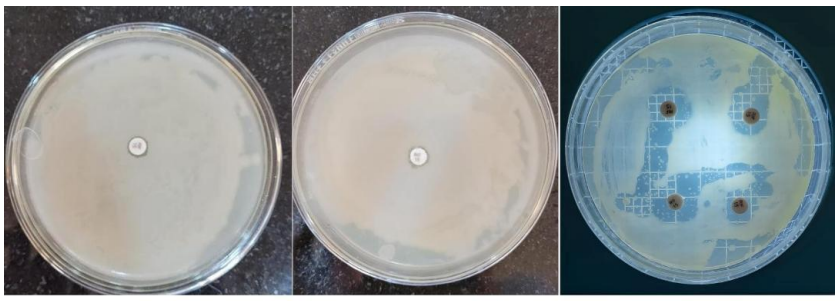


Fig 4: mitotic index of plant extract in comparison to water and standard

Anti- bacterial assay:

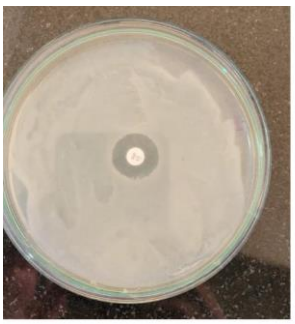
It is observed that methanolic corn silk extract showed activity against S. typhi, S. flexnerii, B. subtilis, S. aureus at concentration of 100 mg /ml and different zone of inhibitions were seen.



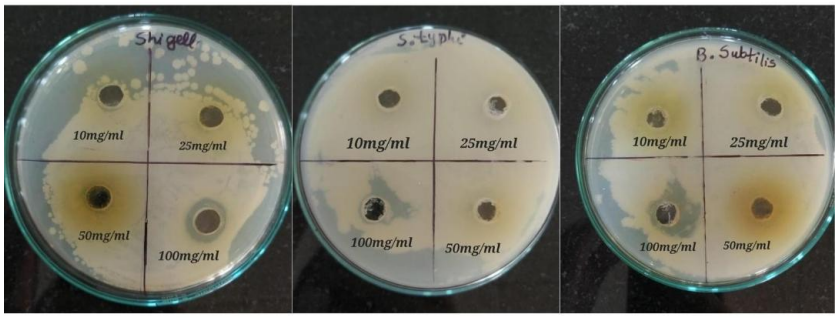
Standard (rifampicin) shigella.

Standard (rifampicin) S. Typhi

Standard (rifampicin) B. Subtilis



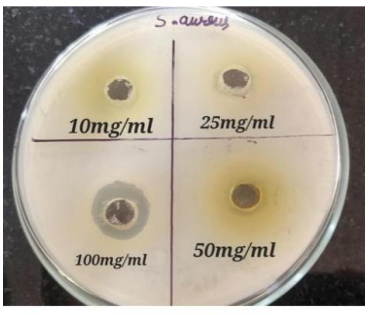
Standard (rifampicin) S. aureus



Shigella zone of inhibition (ZOI) at 100 mg = 5mm

S. typhi zone of inhibition (ZOI) at 100 mg = 9 mm

B. Subtilis zone of inhibition (ZOI) at 100 mg = 12 mm



S. aureus zone of inhibition (ZOI) at 100 mg = 8 mm

Discussion :

Altough many research has been done on corn silk , but few research has been only done to explore anti – mitotic and anti – bacterial potential of corn silk extract. As it shows significant anti- mitotic potential , thus further can be utilized as anti – cancer drug . A. cepa has been used as host model to check its anti – mitotic potential , however other animal cell lines can also be tested .

It also has activity against pathogenic strains such as Shigella and S. typhi so can be potential antibiotic if researched further.

Conclusion :

The current study demonstrates that the methanolic extract of Zea mays silk has substantial anti-bacterial and anti-mitotic characteristics that may be further investigated for antibiotics and anti-cancer therapies. Future research suggests that this treatment may be promising because it has fewer adverse effects than current treatments.

Acknowledgement:

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