CUSCP/IAEC/24/2014. The animals were housed in polypropylene cages, maintained under standard conditions (12h / 12h light and dark) at 25 ± 3° C and 35 – 60% humidity. They were fed with standard rat pellet and water *ad libitum.*

Acute toxicity study

OECD guidelines 423 were followed to carry out acute toxicity study at dose level of 2000mg/kg. This study was carried out by administering the test solutions orally to rats, at the dose level of 2000 mg/kg for 14 days, to check whether the test solution has any toxic effects. Signs and symptoms of toxicity were observed for next 48 hrs. No toxicity or death was observed in the experimental rats when they were subjected to toxicity study.

Induction of ulcers

Ethanol induced gastric ulcers

Rats were fasted for 18 hours and then were administered orally with the drug, standard and normal saline solution. One hour later rats were administered 90% ethanol (5mg/kg) orally. The rats were anesthetized using pentobarbitone and then euthanized by CO_2, 1 hour after ethanol treatment. The stomach of each rat was excised and opened along the greater curvature. The gastric content of each rat was collected in a graduated tube. The stomach was rinsed with saline solution. Ulcer area on the surface of each stomach was examined.

Aspirin induced gastric ulcers

Rats were fasted for 18 hours and then were administered orally with test drug, standard and normal saline solution. One hour after the treatment, all the rats received aspirin (300mg/kg) to induce gastric ulcers. After 5 hours, rats were anesthetized using pentobarbitone and then euthanized by CO_2. The stomach of each rat was excised and open along the greater curvature. Ulcer area on the surface of the stomach was examined.

Stress induced ulcers

Stress ulcers were induced by forced swimming in glass cylinder containing water to the height of 5 cm and maintained at 25°C for 3 hours. Rats were fasted for 18 hours prior to induction of ulcers. After the treatment with test drug, standard and normal saline solution, rats were allowed to swim in water for 3 hours. Rats were anesthetized using pentobarbitone and then euthanized by CO_2. The stomach of each rat was excised and open along the greater curvature. The gastric content of each stomach was collected in a graduated tube. Ulcer area on the surface of the stomach was examined.

Experimental design

The animals were divided into six groups of 6 animals each (table no.1).

Statistical data analysis

Statistical analysis was carried out using instat software. All the results were expressed as mean ± SEM. Post hoc Dunnett's test was used to determine statistical significance of the results obtained.

Histopathological studies

At the end of the study, animals were sacrificed and stomach was isolated for histopathological studies.

RESULTS AND DISCUSSION

Starch, gums and mucilage, proteins and amino acid, flavonoids, tannins and phenolic compounds and glycosides were found to present in the extract.

Table no. 1. Groups of animals for antiulcer study

	No. of Animals	Name of drug
Group I(normal control)	06	Nil
Group II (negative control)		
Group II-A	06	Ethanol
Group II-B	06	Aspirin
Group II-C	06	Stress induced ulcers
Group IV	06	Omeprazole

Table no. 2. Ulcer score and ulcer index

Groups	Ulcer score (mean ± SEM)	No. of ulcers (mean ± SEM)	Ulcer index (mean ± SEM)
Normal control	-	-	-
Negative control	5.55 ± 0.24	389.1 ± 13.7	5.00 ± 0.1
Standard	0.34 ± 0.2**	2.66 ± 0.4**	0.03 ± 0.005**
Ethanol induced ulcers + DGL extract	4.56 ± 0.23**	20.67 ± 3.5**	0.45 ± 0.03**
Aspirin induced ulcers + DGL extract	4.12 ± 0.3**	25.45 ± 3.9**	0.67 ± 0.02**
Stress induced ulcers + DGL extract	3.67 ± 0.21**	16.45 ± 3.4**	0.23 ± 0.002**

a) N = 6, values expressed as mean ± SEM, **p<0.01, Dunnett's test compared to negative control

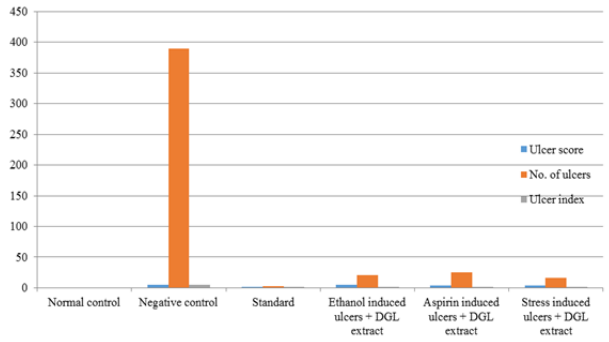


Fig. 1: Effect of DGL extract on ulcer score, number of ulcers and ulcer index

Ulcer score, ulcer index and number of ulcers

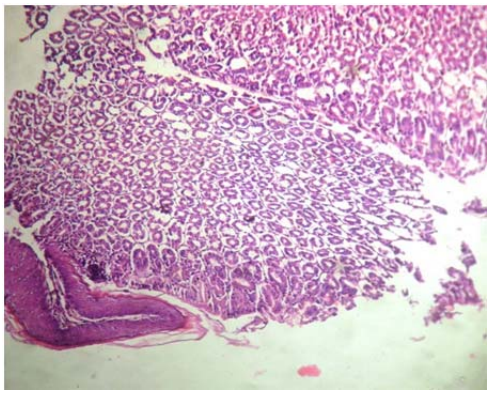
Oral administration of ethanol and aspirin produced deep gastric ulceration. Ulceration was significantly reduced in DGL extract treatment group animals. Ulcer score, ulcer index and number of ulcers was found to be statistically significant when compared to negative control. When treated with DGL extract, the ulcer score was found to be 4.56 ± 0.23 for ethanol induced gastric ulcers. 4.12 ± 0.3 for aspirin induces gastric ulcers and 3.67 ± 0.21 for stress induced gastric ulcers. Negative control group had ulcer index of 5.00 ± 0.1, which was significantly reduced to 0.45 ± 0.03, 0.67 ± 0.02 and 0.23 ± 0.002 for ethanol induced, aspirin induced and stress induced ulcers respectively. Number of ulcers were significantly reduced to 20.67 ± 3.5, 25.45 ± 3.9 and 16.45 ± 3.4 for ethanol induced, aspirin induced and stress induced ulcers respectively (table no.2 and fig.1)

Histopathological studies

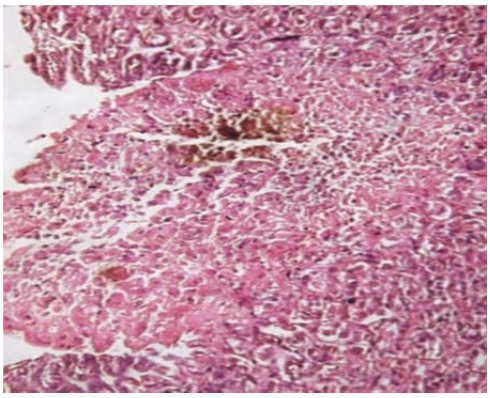
After the treatment with drug, aspirin induced ulcers in rats (fig.2.4) and ethanol induced ulcers in rats (fig.2.6) treated with DGL extract showed mildly multifocal ulcers as compared to the negative control group (fig.2.3). Whereas, stress induced ulcer group animals treated with DGL extracts showed minimally multifocal ulcers as compared to aspirin and ethanol induced ulcer groups treated with DGL extract (fig.2.5). Severity of ulcers is mild in rats in case of aspirin induced and ethanol induced ulcers group as compared to that of the negative control group, where the severity of ulcer is mild to moderate in stress induced ulcers (table no.3). Grade of inflammation is more for negative control group as compared to the standard treatment group and DGL extract treated groups (table no.3). Hence, from the above study, it can be concluded that DGL extracts can lower the frequency of ulcers, reduce the severity and inflammation of ulcers.

Table no. 3. Effect of DGL extract on ulcer induced rat model

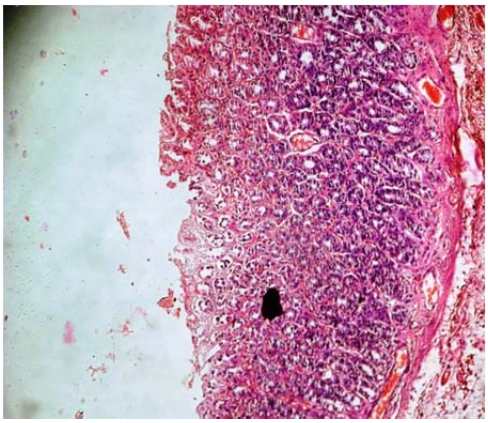
Sample particulars	Frequency of ulcers	Severity of ulcers	Grade of inflammation
Normal control	Nil	---	0
Negative control	Moderate multifocal	Mild to moderate	2 - 3
Standard	Minimally multifocal	---	0
Aspirin Induced + Drug	Mildly multifocal	Mild	1 - 2
Stress Induced + Drug	Minimally multifocal	---	0
Ethanol Induced + Drug	Mildly multifocal	Mild	1 - 2



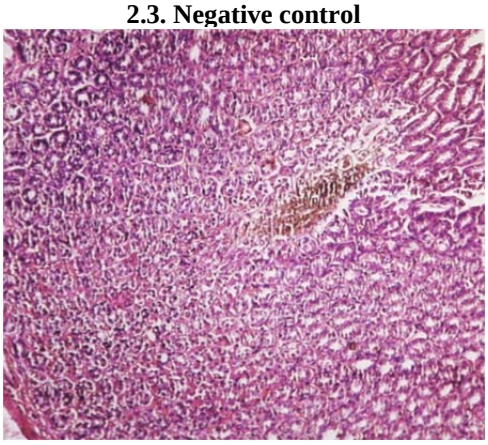
2.1. Normal control



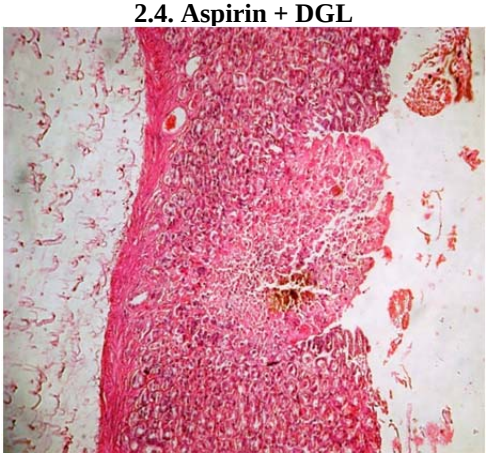
2.2. Standard drug (Omeprazole)



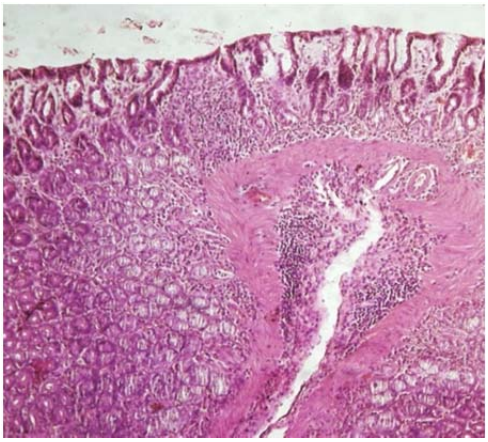
2.3. Negative control



2.4. Aspirin + DGL



2.5. Stress induced ulcers + DGL



2.6. Ethanol + DGL

Fig. 2: Histopathological examination of stomach of rats

CONCLUSION

The phytochemical investigation of ethanolic extract of DGL revealed the presence of starch, gums and mucilage, proteins and amino acid, flavonoids, tannins and glycosides. Antiulcer activity of DGL was evaluated using three models i.e. ethanol induced ulcer model, aspirin induced ulcer model and stress induced ulcer model. There was a statistically significant reduction in ulcer score, ulcer index and number of ulcers indicating promising antiulcer activity.

From the above study, it can be concluded that DGL extract was found to lower the frequency of ulcers, reduce the severity and inflammation of ulcers in all the three ulcer models.

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