DISCUSSION

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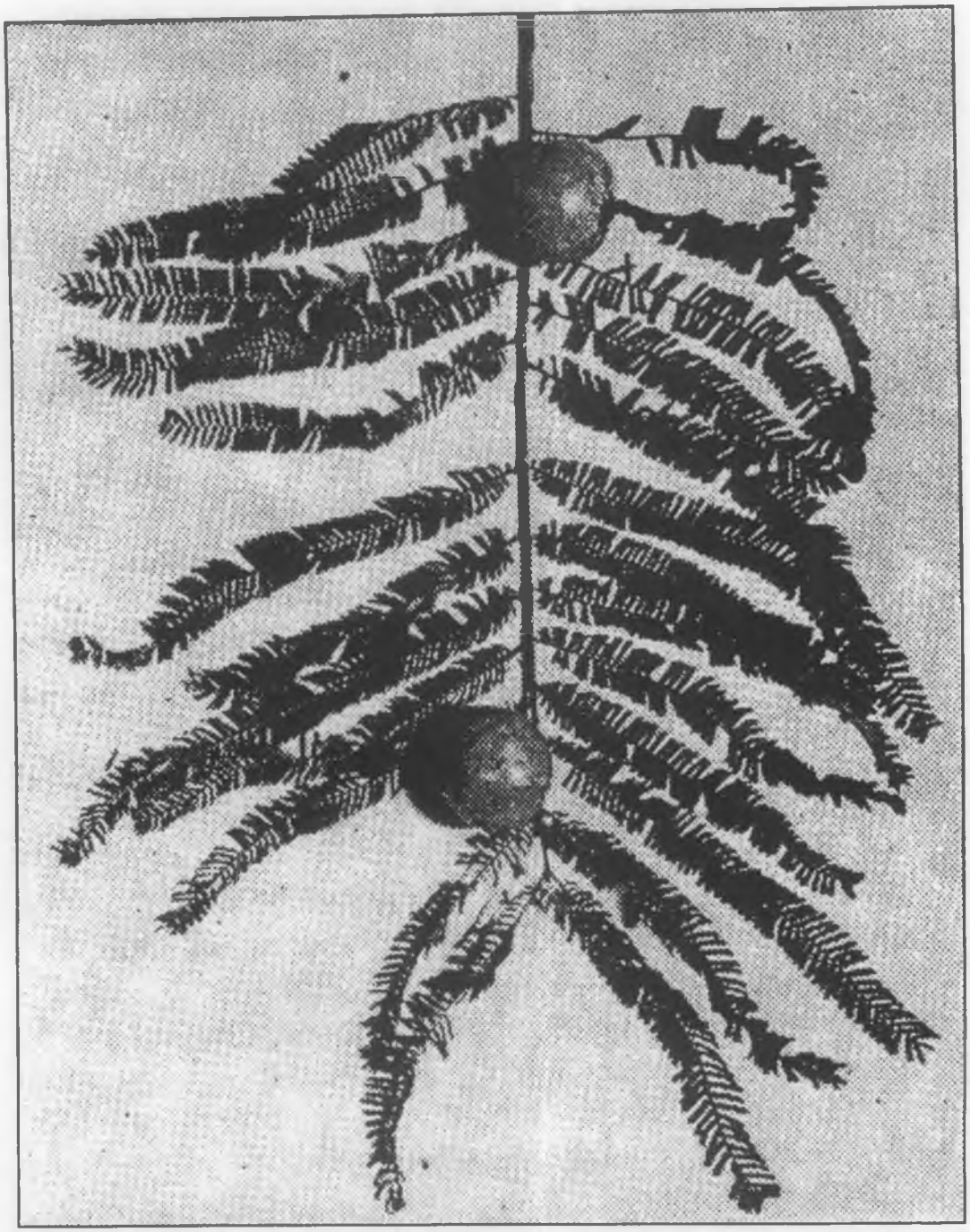
Amlaki tree is common in the mixed deciduous forests of India ascending to 4500 ft on the hills. It is often cultivated in gardens and home yards. Cultivation of this tree is found in almost all parts of India but the States of Uttar Pradesh and Madhya Pradesh demand its major cultivation.

In autum the tree bears fruit. Fruit "amlaki" is green in unripe stage and changes to gray during ripening. Medium sized circular fruit amlaki has the botanical name *Emblica officinalis* Linn. In different countries as well as in different languages fruit amlaki is called as under (191):

NEPAL	: Amla	BURMA	: Shabju
ARAB	: Amlaj	INDIA	: Amla / Amlaki
SANSKRIT	: Dhatri	HINDI	: Amla
BENGALI	: Amloki	ORIYA	: Aora
TAMIL	: Nellikka	SANTAL	: Meral
PUNJABI	: Ambal	KANADA	: Amlaka
MALAYALAM	: Nelli	TELEGU	: Amalakamu
GUJARATI	: Amran	MARATHI	: Amla

Fruit amlaki (*Emblica officinalis* Linn.) has a sour and astringent taste. Chemical analysis of the fruit revealed (192, 193) the following composition :

Plenty amount of vitamin – C; amino acid like glycine; polyphenolic compounds



Emblica officinalis Linn.

like corilagin, ellagic acid, terehebin, gallic acid, chebulic acid, chebulagic acid, chebulinic acid; fixed oil; essential oil; tannin and lipids like phosphatides.

Fruit amlaki (*Emblica officinalis* Linn.) is a common medicine used everyday in Indian household. It is diuretic, anti-emetic and laxative. When dried, the fruit is useful in haemorrhage, diarrhoea and dysentery. In combination with iron the fruit is used in jaundice, anaemia, dyspepsia and cough. Sharbat of the fruit with lemon juice is given to arrest acute bacillary dysentery. Exudation from incisions on the fruit is used as external application for the inflammation of eye. As a very good source of vitamin – C, the fruit is successfully used in the treatment of human scurvy. It is reported that fruit amlaki (*Emblica officinalis* Linn.) is good for digestive and nervous systems as well as cardio-vascular and reproductive systems (194 – 199).

In experimental system fruit amlaki (*Emblica officinalis* Linn.) can protect myocardinal necrosis in rats and is beneficial in cholesterol induced artherosclerosis in rabbits. It is also beneficial for duck against hepatitis B virus in vitro and in vivo (200 – 203).

In addition, fruit amlaki (*Emblica officinalis* Linn.) is efficacious for peptic ulcer. Verma *et al.* have demonstrated (151) that radiologically proved peptic ulcer patients get relief symptomatically when taken fruit amlaki as drug. Healing of ulcer was also evident from the X-ray plate. Bany *et al.* said " Amla cures peptic ulcer in experimental system" (204). Research from our laboratory also indicated the anti-ulcer effect of fruit amlaki (*Emblica officinalis* Linn.) in certain experimental ulcer models induced by non steroidal anti inflammatory agents like aspirin, indomethacin, salicylic acid etc.(152 – 154).

The present work, thus, was an attempt to evaluate the anti-ulcer activity of fruit amlaki (*Emblica officinalis* Linn.) and its effect on various biochemical parameters in experimental ulcer models induced by different types of stress like ;

1. Restraint stress + Aspirin
2. Haemorrhagic shock
3. Restraint stress + Water immersion
4. Restraint stress + Cold
5. Swimming stress
6. Activity stress
7. Aspirin + Short term stress
8. Indomethacin + Short term stress.

Restraint + Aspirin induced stress ulcers : Role of Amlaki (*Emblica officinalis* Linn.)

Parmer *et al.* while working on the ulcerogenic role of restraint + aspirin in rats, observed (164) that restraint + aspirin produced severe ulcers in glandular part of stomach of the animals. In the present study it was also noticed (Table – 1) that restraint + aspirin (50 mg/kg, p.o.) produced profuse ulcers in the glandular part of stomach. Ulcers were associated with frank intragastric haemorrhage. There were adhesion, acute dilatation and even perforation in stomachs of the animals.

Conflicting reports are available in the literature regarding the effect of Restraint + aspirin on the volume of gastric juice, gastric acidity and peptic activity. Menguy (29) reported that restraint caused a decrease in volume and acidity of gastric secretion while a number of workers (27,28, 205 - 208) found that restraint increased the rate of gastric secretion and gastric acidity. Yoshikawa et al. (209), however, showed that restraint stress did not have any effect on gastric acidity and peptic activity. In the present study it was observed that restraint + aspirin (50 mg/kg, p.o.) had no significant effect on rate of gastric secretion, gastric acidity and peptic activity (Table – 9).

Restraint + aspirin was found to decrease significantly ($p < 0.01$ to $p<0.001$) the levels of gastric dissolved mucin and gastric mucosal mucus when measured its constituent carbohydrate components (Table 17 and 25). Menguy (29) and other workers (207 – 209) also observed a reduction in the rate of synthesis and secretion of mucus by restraint stress. They thus said, " It is the loss of mucus barrier that permits the toxic effects of restraint stress to produce ulcers in stomach". In addition to loss of mucus barrier we observed that restraint + aspirin could increase ($p < 0.001$) the levels of lipid peroxides and decrease ($p < 0.001$) the amount of DNA of gastric mucosa of rats (Table – 33).

Effect of Amlaki (*Emblica officinalis* Linn.) on restraint + aspirin induced gastric ulcers in rats was not reported in the available literature. We have noted that powdered fruits of Amlaki (*Emblica officinalis* Linn.) in the oral dose of 0.75 g /kg/day for three consecutive days prior to give restraint + aspirin treatment could prevent gastric ulcer induced by restraint + aspirin.(Table – 1).This anti-ulcer effect of Amlaki (*Emblica officinalis* Linn.) was not related with gastric secretion, gastric acidity and peptic activity (Table – 9) but had relation with mucus secretion, lipid peroxidation and DNA content of the stomach. We had seen that Amlaki (*Emblica officinalis* Linn.) could increase the amount of gastric mucus (Tables – 17, 25), decrease lipid peroxides and increase DNA content of gastric mucosa (Table – 33) and thus exerted its anti – ulcer effect. All changes were found statistically significant ($p < 0.025$ to $p < 0.001$).

Table – 2 showed that haemorrhagic shock when given to rats by the established method (165) induced profuse ulcers in glandular part of stomach and the stomachs were invariably accompanied by frank intragastric haemorrhage - an earlier observation made by Kokoschka et al. (90) in dogs.

Studies related to the effect of haemorrhagic shock on the rate of gastric secretion, gastric acidity , peptic activity and on mucus secretion are not found in the available literature. We, however, observed no significant change in volume, acidity and peptic activity of gastric secretion by the haemorrhagic shock. (Table – 10).

We, further, found that haemorrrhagic shock reduced the amount of dissolved gastric mucin as well as gastric mucosal mucus. The constituent carbohydrate components of dissolved gastric mucin and mucosal mucus viz. total hexoses, hexosamine, methyl pentose, sialic acid etc. showed a significant decrease ($p < 0.025$ to $p < 0.001$) in levels when compared to that of control values. The amount of dissolved mucin and mucosal mucus as represented by total carbohydrate (64) also showed a significant decrease ($p < 0.001$) during haemorrhagic shock. (Tables – 18, 26).

We have also noted that haemorrhagic shock increased the concentration of lipid peroxides and decreased the amount of DNA of gastric mucosa (Table – 34). Results were statistically significant ($p < 0.001$) when compared to that of control values.

Effect of Amlaki (*Emblica officinalis* Linn.) on haemorrhagic shock induced gastric ulcers in albino rats was not reported in the available literature. We have noted that powdered fruits of Amlaki (*Emblica officinalis* Linn.) in the oral dose of 0.75 g /kg/day for three consecutive days before the induction of haemorrhagic shock could prevent gastric ulcer induced by haemorrhagic shock (Table – 2). Ulcer index came down from 22 to 7. This anti-ulcer effect of Amlaki (*Emblica officinalis* Linn.) was not related with gastric secretion, gastric acidity and peptic activity (Table – 10) but had relation with mucus secretion, lipid peroxidation and DNA content of the stomach. We have seen that Amlaki (*Emblica officinalis* Linn.) could increase the amount of gastric mucus (Tables – 18, 26), decrease lipid peroxides and increase DNA content of gastric mucosa (Table – 34) and thus exerted its anti – ulcer effect. All changes were found statistically significant ($p < 0.025$ to $p < 0.001$).

Restraint + Water immersion induced stress ulcers : Role of Amlaki (*Emblica officinalis* Linn.)

Several reports (25, 116, 131, 132) are available in the literature showing ulcerogenic potency of restraint + water immersion induced stress in experimental animals. Researchers have noted that restraint + water immersion induces gastric ulcer in rats. We also observed the presence of ulcers associated with haemorrhage (68.7%) at glandular part of the stomach of albino rats when the animals received restraint + water immersion induced stress as per established method (166). Out of 32 rats 3 animals died during experiment showed the extension and perforation of ulcers. These findings (Table – 3) were in agreement with the earlier reported observations (131, 132).

When studied the effect of restraint + water immersion on acid-peptic as well as mucus factor, we found that this method of giving stress had no effect on the rate of gastric secretion, gastric acidity and peptic activity (Table – 11). But the mucus factor represented by the levels of dissolved gastric mucin and gastric mucosal mucus was found significantly ($p<0.025$ to $p < 0.001$) decreased in comparison to that of control values (Table – 19,27). Earlier, this was observed by Hayasi *et al.*(116) who stressed on the fact that diminution of tissue resistance is related to the action of restraint + water immersion in the genesis of ulceration. Miyakawa et al. (132), however, showed increased gastric secretion after giving restraint + water immersion stress in albino rats.

Ulcerogenic property of restraint + water immersion stress has not been explained earlier in terms of lipid peroxidation. We have noted that restraint + water immersion stress could increase the level of lipid peroxides and decrease the amount of DNA of gastric mucosa in albino rats (Table – 35). Results were statistically significant ($p < 0.001$) when compared to that of control values.

Effect of Amlaki (*Emblica officinalis* Linn.) on restraint + water immersion stress induced gastric ulcers in albino rats was not reported in the available literature. We found that powdered fruit of Amlaki (*Emblica officinalis* Linn.) in the oral dose of 0.75 g /kg/day for three consecutive days prior to give restraint + water immersion stress could prevent gastric ulcer induced by restraint + water immersion (Table – 3). Initially ulcer index was 20. After Amlaki (*Emblica officinalis* Linn.) treatment ulcer index came down to 8. This anti-ulcer effect of Amlaki (*Emblica officinalis* Linn.) was not related with gastric secretion, gastric acidity and peptic activity (Table – 11) but had relation with mucus secretion, lipid peroxidation and DNA content of the stomach. We had seen that Amlaki (*Emblica officinalis* Linn.) could increase the amount of gastric mucus (Tables – 19,27), decrease lipid peroxides and increase DNA content of gastric mucosa (Table – 35) and thus exerted its anti – ulcer effect. All changes were found statistically significant

($p < 0.025$ to $p < 0.001$) when compared to the values of restraint + water immersion group.

Restraint + Cold induced stress ulcers : Role of Amlaki (*Emblica officinalis* Linn.)

Table – 4 showed that restraint + cold induced stress when given to rats by the established method (167) produced profuse ulcers in glandular part of stomach and the stomachs were invariably accompanied by frank intra gastric haemorrhage (70.9%) - an earlier observation made by several workers (21,22,105).

Studies related to the effect of restraint + cold induced stress on the rate of gastric secretion, gastric acidity , peptic activity showed contradictory results. Several workers demonstrated that cold restraint stress could increase gastric acid-pepsin (210-213) while others noted no change in these values after giving this stress (214-218). We, however, observed no significant change in volume, acidity and peptic activity of gastric secretion when given restraint + cold induced stress to rats. (Table – 12).

We, further, found that restraint + cold induced stress reduced the amount of dissolved gastric mucin as well as gastric mucosal mucus. The constituent carbohydrate components of dissolved gastric mucin and mucosal mucus viz. total hexoses, hexosamine, methyl pentose, sialic acid etc. showed a significant decrease ($p < 0.025$ to $p < 0.001$) in levels when compared to that of control values. The amount of dissolved mucin and mucosal mucus as represented by total carbohydrate (64) also showed a significant decrease ($p < 0.001$) during cold restraint stress (Tables – 20, 28). Decreased mucus secretaion after giving restraint + cold stress was also observed by other workers (214-218). Few workers, however, did not show any change in the mucus secretion after giving cold restraint stress to albino rats (219,220).

We have also noted that restraint + cold stress increased the concentration of lipid peroxides and decreased the amount of DNA of gastric mucosa (Table – 36). Results were statistically significant ($p < 0.001$) when compared to that of control values.

Effect of Amlaki (*Emblica officinalis* Linn.) on restraint + cold stress induced gastric ulcers in albino rats was not reported in the available literature. We have noted that powdered fruits of Amlaki (*Emblica officinalis* Linn.) in the oral dose of 0.75 g /kg/day for three consecutive days before the induction of cold restraint stress, could prevent gastric ulcer induced by restraint + cold stress (Table – 4). Ulcer index came down from 18 to 8. This anti-ulcer effect of Amlaki (*Emblica officinalis* Linn.) was not related with gastric secretion, gastric acidity and peptic activity (Table – 12) but had relation with mucus secretion, lipid peroxidation and DNA content of the stomach. We have seen that Amlaki (*Emblica officinalis* Linn.) could increase the amount of gastric

mucus (Tables – 20, 28), decrease lipid peroxides and increase DNA content of gastric mucosa (Table – 36) and thus exerted its anti – ulcer effect. All changes were found statistically significant ($p < 0.025$ to $p < 0.001$).

Swimming induced stress ulcers : Role of Amlaki (*Emblica officinalis* Linn.)

There is report that forced swimming developed ulcer in stomach of albino rats (168). We have also noted that swimming for 3 hours at a stretch induced ulcers in the glandular part of the stomach in rats. Ulcers, developed in all rats, were accompanied by frank gastric haemorrhage in 68.9% of the animals. There were adhesion even perforation in certain animals (Table – 5).

We found that swimming stress had no effect on the rate of gastric secretion, gastric acidity and peptic activity (Table – 13) but decreased the levels of dissolved gastric mucin and gastric mucosal mucus (Tables – 21, 29). All carbohydrate components of mucus like total hexoses, hexosamine, methyl pentose and sialic acid were found decreased significantly ($p < 0.025$ to $p < 0.001$) in gastric juice and gastric mucosa after giving swimming stress in comparison to the control values. In the available literature , however, there are no reports on gastric acid-pepsin and mucosubstances related with ulcers during swimming stress.

Ulcerogenic potency of swimming stress has not been explained earlier in terms of lipid peroxidation. We, however, noted that swimming stress could increase the level of lipid peroxides and decrease the amount of DNA of gastric mucosa in rats (Table – 37). Results were statistically significant ($p < 0.001$) when compared to that of control values.

Effect of Amlaki (*Emblica officinalis* Linn.) on swimming stress induced gastric ulcers in albino rats was not reported in the available literature. We found that powdered fruit of Amlaki (*Emblica officinalis* Linn.) in the oral dose of 0.75 g /kg/day for three consecutive days prior to give swimming stress could prevent gastric ulcer induced by swimming stress (Table – 5). Initially ulcer index was 19. After Amlaki (*Emblica officinalis* Linn.) treatment ulcer index came down to 10. This anti-ulcer effect of Amlaki (*Emblica officinalis* Linn.) was not related with gastric secretion, gastric acidity and peptic activity (Table – 13) but had relation with mucus secretion, lipid peroxidation and DNA content of the stomach. We had seen that Amlaki (*Emblica officinalis* Linn.) could increase the amount of gastric mucus (Tables –21,29), decrease lipid peroxides and increase DNA content of gastric mucosa (Table –37) and thus exerted its anti – ulcer effect. All changes were found statistically significant ($p < 0.025$ to $p < 0.001$) when compared to the values obtained in the group of swimming stress.

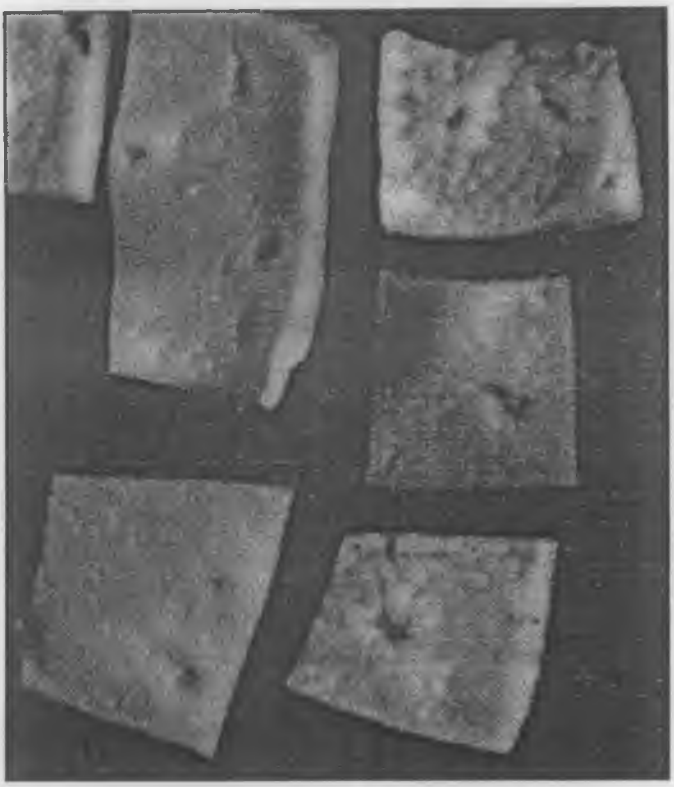


Figure-1 : Showing swimming stress induced ulcers in the stomach of albino rat.

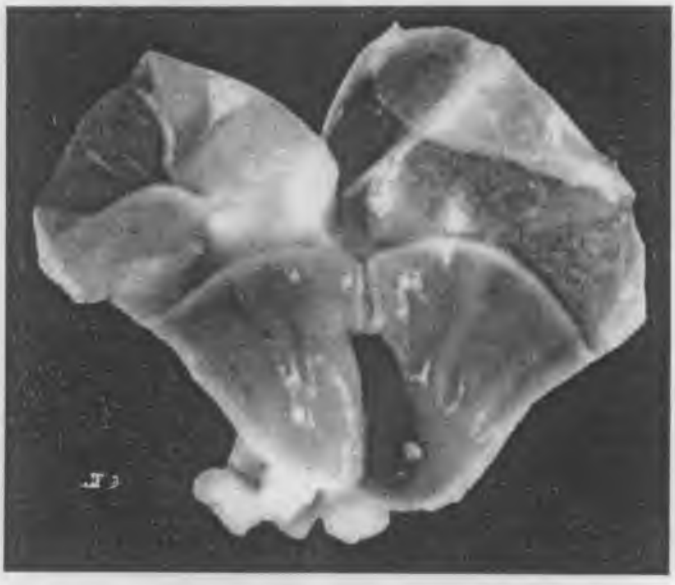


Figure-2 : Showing the effect of Amlaki (*Emblica officinalis* Linn.) on swimming stress induced ulcers in the stomach of albino rat.

Activity stress induced ulcers : Role of Amlaki (*Emblica officinalis* Linn.)

Pare (169) for the first time noted that high activity levels of rats could induce extensive lesions in the glandular stomach. Since these glandular lesions resembled the "stress ulcer" reported by other workers and since the activity was shown to be instrumental in their development, these lesions have been designated as "activity stress ulcers". Interestingly, animals developing activity-stress gastric lesions were hyposecretors of gastric acid (221) and did not respond to histamine H2 blockers (222). Activity stress gastric lesions were, however, reduced by centrally acting agents such as diazepam and imipramine suggesting that aberrations in central neurotransmission played a vital role in their development (223). However, some local factors also contributed to activity-stress gastric damage (224).

In the present study we have also noted that activity stress induced ulcers in the glandular part of the stomach in rats. Ulcers, developed in all rats, were accompanied by frank gastric haemorrhage in 86.6% of the animals. There were adhesion, dilatation even perforation in certain animals (Table – 6).

We found that activity stress had no effect on the rate of gastric secretion, gastric acidity and peptic activity (Table – 14) but decreased the levels of dissolved gastric mucin and gastric mucosal mucus (Tables – 22, 30). All carbohydrate components of mucus like total hexoses, hexosamine, methyl pentose and sialic acid were found decreased significantly ($p < 0.025$ to $p < 0.001$) in gastric juice and gastric mucosa after giving activity stress in comparison to the control values.

Ulcerogenic potency of activity stress has not been explained earlier in terms of lipid peroxidation. We, however, noted that activity stress could increase the level of lipid peroxides and decrease the amount of DNA of gastric mucosa in rats (Table – 38). Results were statistically significant ($p < 0.001$) when compared to that of control values.

Effect of Amlaki (*Emblica officinalis* Linn.) on activity stress induced gastric ulcers in albino rats was not reported in the available literature. We found that powdered fruit of Amlaki (*Emblica officinalis* Linn.) in the oral dose of 0.75 g /kg/day for three consecutive days prior to give activity stress could prevent gastric ulcer induced by the activity stress (Table – 6). Initially ulcer index was 20. After Amlaki (*Emblica officinalis* Linn.) treatment ulcer index came down to 10. This anti-ulcer effect of Amlaki (*Emblica officinalis* Linn.) was not related with gastric secretion, gastric acidity and peptic activity (Table – 14) but had relation with mucus secretion, lipid peroxidation and DNA content of the stomach. We had seen that Amlaki (*Emblica officinalis* Linn.) could increase the amount of gastric mucus (Tables –22,30), decrease lipid peroxides and

increase DNA content of gastric mucosa (Table –38) and thus exerted its anti – ulcer effect. All changes were found statistically significant ($p < 0.025$ to $p < 0.001$) when compared to the values obtained in the group of activity stress.

Aspirin + Short term stress induced ulcers : Role of Amlaki (*Emblica officinalis* Linn.)

Table – 7 shows the effect of aspirin + short term stress on the development of gastric ulcers in albino rats. We have noted that aspirin & short term stress induced ulcers in the glandular part of the stomach in rats. Ulcers, developed in all rats, were accompanied by frank gastric haemorrhage in 78.9% of the animals. There were adhesion, dilatation even perforation in certain animals. Leitold *et al.* (170) also showed the induction of ulcers in glandular part of the stomach by treating the animals with aspirin + Short term stress.

We found that this type of stress had no effect on the rate of gastric secretion, gastric acidity and peptic activity (Table – 15) but decreased the levels of dissolved gastric mucin and gastric mucosal mucus (Tables – 23, 31). All carbohydrate components of mucus like total hexoses, hexosamine, methyl pentose and sialic acid were found decreased significantly ($p < 0.025$ to $p < 0.001$) in gastric juice and gastric mucosa after giving aspirin and short term stress in comparison to the control values.

Ulcerogenic potency of this stress has not been explained earlier in terms of lipid peroxidation. We, however, noted that aspirin + short term stress could increase the level of lipid peroxides and decrease the amount of DNA of gastric mucosa in rats (Table – 39). Results were statistically significant ($p < 0.001$) when compared to that of control values.

Effect of Amlaki (*Emblica officinalis* Linn.) on aspirin + short term stress induced gastric ulcers in albino rats was not reported in the available literature. We found that powdered fruit of Amlaki (*Emblica officinalis* Linn.) in the oral dose of 0.75 g /kg/day for three consecutive days prior to give this stress could prevent gastric ulcer induced by the aspirin + short term stress (Table – 7). Initially ulcer index was 24. After Amlaki (*Emblica officinalis* Linn.) treatment ulcer index came down to 11. This anti-ulcer effect of Amlaki (*Emblica officinalis* Linn.) was not related with gastric secretion, gastric acidity and peptic activity (Table – 15) but had relation with mucus secretion, lipid peroxidation and DNA content of the stomach. We had seen that Amlaki (*Emblica officinalis* Linn.) could increase the amount of gastric mucus (Tables –23,31), decrease lipid peroxides and increase DNA content of gastric mucosa (Table –39) and thus exerted its anti – ulcer effect. All changes were found statistically significant ($p < 0.025$ to $p < 0.001$).

Indomethacin + Short term stress induced ulcers : Role of Amlaki (*Emblica officinalis* Linn.)

Weischer *et al.* demonstrated (171) that indomethacin + short term stress could generate profuce ulcers at glandular part of the stomach in albino rats. We have also noted that indomethacin (4 mg/kg) + short term stress induced ulcers in the glandular part of the stomach in rats (Table – 8). All animals undertook this stress developed ulcers in stomachs which were invariably associated with frank intra gastric haemorrhage. Adhesion, dilatation and perforation were noted in the ulcerated stomachs of the animals.

We found that this type of stress had no effect on the rate of gastric secretion, gastric acidity and peptic activity (Table – 16) but decreased the levels of dissolved gastric mucin and gastric mucosal mucus (Tables – 24, 32). All carbohydrate components of mucus like total hexoses, hexosamine, methyl pentose and sialic acid were found decreased significantly ($p < 0.025$ to $p < 0.001$) in gastric juice and gastric mucosa after giving indomethacin and short term stress in comparison to the control values. There was ,however, no report in this regard in the available literature.

Ulcerogenic potency of this stress has not been explained earlier in terms of lipid peroxidation. We, however, noted that indomethacin + short term stress could increase the level of lipid peroxides and decrease the amount of DNA of gastric mucosa in rats (Table – 40). Results were statistically significant ($p < 0.001$) when compared to that of control values.

Effect of Amlaki (*Emblica officinalis* Linn.) on indomethacin + short term stress induced gastric ulcers in albino rats was not reported in the available literature. We found that powdered fruit of Amlaki (*Emblica officinalis* Linn.) in the oral dose of 0.75 g /kg/day for three consecutive days prior to give this stress could prevent gastric ulcer induced by the indomethacin + short term stress (Table – 8). Initially ulcer index was 23. After Amlaki (*Emblica officinalis* Linn.) treatment ulcer index came down to 12. This anti-ulcer effect of Amlaki (*Emblica officinalis* Linn.) was not related with gastric secretion, gastric acidity and peptic activity (Table – 16) but had relation with mucus secretion, lipid peroxidation and DNA content of the stomach. We had seen that Amlaki (*Emblica officinalis* Linn.) could increase the amount of gastric mucus (Tables – 24,32), decrease lipid peroxides and increase DNA content of gastric mucosa (Table – 40) and thus exerted its anti – ulcer effect. All changes were found statistically significant ($p < 0.025$ to $p < 0.001$) in comarison to that of indomethacin + short term stress.

Concept of antiulcerogenic property of indigenous plants and fruits was not new. Several reports are now available in literature (135 – 163, 225). In the present study

we confirmed anti–ulcer property of Amlaki (*Emblica officinalis* Linn.) and explored the possible mechanism behind this anti–ulcer property. Our observations were :

1. Amlaki (*Emblica officinalis* Linn.) could decrease the incidence and severity of gastric ulcers in experimental ulcer models induced by various kinds of stress like restraint + aspirin, haemorrhage, restraint + water immersion, restraint + cold, swimming stress, activity stress, aspirin + short term stress and indomethacin + short term stress.

2. Amiaki (*Emblica officinalis* Linn.) had no effect on rate of gastric secretion, gastric acidity and peptic activity during ulceration.

3. Amiaki (*Emblica officinalis* Linn.) increased the levels of gastric dissolved mucin and gastric mucosal mucus which were found decreased during ulceration.

4. Amlaki (*Emblica officinalis* Linn.) decreased the level of gastric lipid peroxides which was found increased during ulceration.

5. Amlaki (*Emblica officinalis* Linn.) increased the amount of DNA of gastric mucosa which was found decreased during ulceration.

Thus, we conclude ;

* Amlaki (*Emblica officinalis* Linn.) has anti–ulcer effect against stress induced experimental ulcers.

{Amlaki (*Emblica officinalis* Linn.) could prevent the incidence and severity of ulcers as induced by different kinds of stress to the extent of 60 – 90%}

** Anti-ulcer effect of Amlaki (*Emblica officinalis* Linn.) is through inhlbition of gastric lipid peroxidation.

{ Ulcerogenic drugs could increase gastric lipid peroxidation thereby generate reactive oxygen metabolites. This could damage gastric cells as observed by various workers (65 - 81). This was reflected by decreased amount of DNA in

gastric mucosa which, in turn, was responsible for decreased synthesis of gastric mucosubstances. In absence of proper protective layer of mucosubstances, ulcer developed in the stomach.

Amlaki (*Emblica officinalis* Linn.) ,on the other hand , could inhibit gastric lipid peroxidation thereby inhibit generation of reactive oxygen metabolites. This could protect the gastric cell from damage. DNA of gastric mucosa was, thus, found increased with a concomitant increase in the level of gastric mucosubstances. These mucosubstances gave a proper protection in the stomach for which ulcers could not develop.

Anti-ulcer property of Amlaki (*Emblica officinalis* Linn.) was thus explained by its anti-oxidative activity. } ##