EYE INJURY FROM PLANT SAP OF PEDILANTHUS TITHYMALOIDES POIT

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SYNOPSIS

This is a case report of a Malay boy who sustained eye injury as a result of contact with the sap of the plant, Pedilanthus tithymaloides Poit., which was planted in his garden. An animal experiment was carried out to study the mechanism of the injury. As this plant is a potential hazard to eyes, the study suggests that it should not be planted in gardens and playgrounds where children have easy access. Protective goggles should be worn when cutting it.

INTRODUCTION

Irritant vegetable products are known to cause eye injury when they are brought into contact with the eye (1). The injury may be due to the irritant constituents of the plant or the mechanical factor which may account for or aggravate the injury. Another possible factor is hypersensitivity reaction. Each factor may operate individually or may act in combination to give the final clinical picture.

The plant concerned in this case is Pedilanthus tithymaloides Poit. (Figure 1). It belongs to the Euphorbiaceae family. Plants of this family have a particularly virulent milky sap. Vesicant dermatitis and chemotic conjunctivitis with keratitis would occur if the sap is introduced into an eye (1). The plant sap involved in this case does not produce dermatits when it is in contact with the skin, but will give rise to inflammation of the conjunctiva.

Figure 1

A pot of Pedilanthus tithymaloides Poit.

Pedilanthus tithymaloides is also known as the zigzag plant, or pokok halipan in the Malay language owing to its branching characteristics and similarity in configuration to a centipede or halipan (2). The plant has been used for treatment in traditional practice. The milk from the green parts has been applied to warts, leucoderma, scorpion and centipede bites (3). The roots are powerful emetic, known as "ipecacuanha". The sap is also used for producing a hallucinogenic beverage in the Andean Region known as "cimora" which is a concoction of *Trichocereus pachonoi* (a cactus species), *Neoraimondia macrostibas* (a cactus species), *Iresine* (belonging to the Maranthacene family), *Brugmansia* (belonging to the Solanaceae family), *Isotoma longiflora* (belonging to the Campanulaceae family) and *Pedilanthus tithymaloides* (4). The plant originates from the West Indies and has been brought to various tropical countries where it flourishes. It is a succulent shrub and grows to a height of up to about two meters. The colour of the leaf varies from shades of green and white to full green. Red flowers cluster near the ends of the branches, appearing like little red birds (5). It is grown easily in Malaysia and is commonly found as an ornamental plant in gardens or in public places including hospitals. The plant oozes a white milky sap when any of its parts is broken. The amount of sap is particularly plentiful when borken at the junction of the leaf and the stem (Figure 2). Medical information regarding the plant and its chemical constituents are not available. In view of this limitation, an animal experiment was carried out to find out the mechanism of the injury.

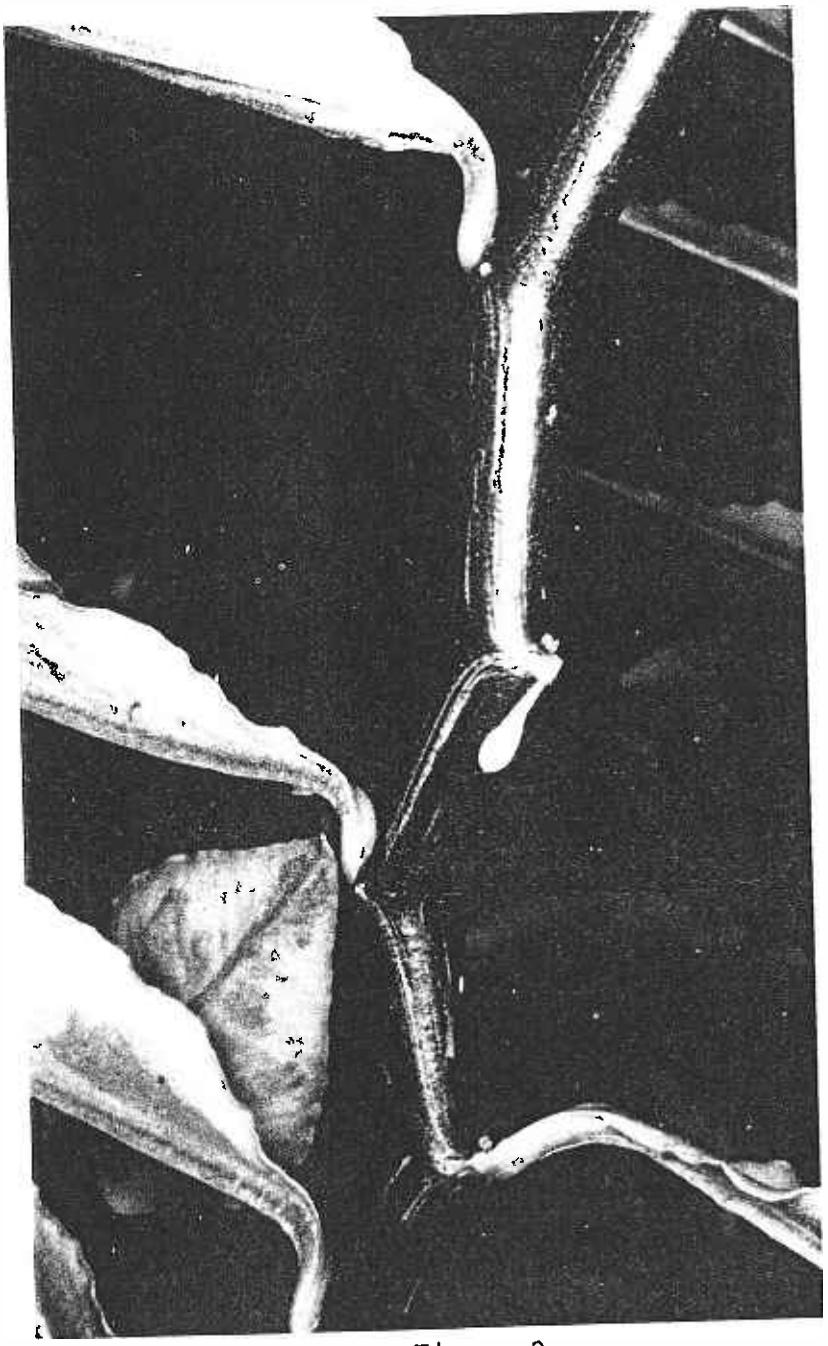

Figure 2

The plant sap dripping from the broken junction of the stem.

CASE REPORT

Master J.A., an eight year old Malay boy, fell into a shrub of *Pedilanthus tithymaloides* while playing in his garden in October 1983. When his mother came to help him, she noticed his left eye and its adjacent areas were covered with milky sap from the plant. Immediately the sap was flushed away with water from a tap. His eyes were also immersed in a basin of tap water. After this, a general practitioner was consulted and topical and systemic medication were given. One hour after the medication, the patient was still crying and complained of excruciating pain in his left eye. He was then sent to the Accident and Emergency Unit of University Hospital where he was admitted.

On examination, the patient's visual acuity of each eye was 6/12. (Simple myopia was found on refraction after the injury had settled). There was moderate lid edema, marked photophobia and lacrimation and severe conjunctivitis with moderate chemosis in the left eye. The cornea revealed small patches of fluorescein staining without opacity. No obvious reaction was noted in the anterior chamber. The pupil was miotic. No foreign body nor dermatitis was noted. The right eye was normal. A diagnosis of chemical keratoconjunctivitis of the left eye was made. Immediate irrigation of the left eye, especially the fornices, was carried out using normal saline under local anaesthesia. Chloramphenicol eye drops was instilled as prophylaxis and Homatropine 2% eye drops was given to relieve the ciliary spasm.

From the next day onwards, topical steroid was used once a day to reduce the inflammation. Total corneal erosion was noted on the second day of admis-

sion and the left visual acuity was reduced to 6/24. No staining of the conjunctiva was found. However, subjective symptoms were improving. A photograph of the cornea (Figure 3) was taken on the third day of admission when the patient was sufficiently co-operative. The healing edge of the corneal epithelium as shown in Figure 3 can be seen advancing from the periphery to the centre, forming a horizontal oval figuration. On the fifth day, only a small area of corneal staining of 1 mm in diameter was noted. On the seventh day, the corneal erosion had disappeared except for a new superficial punctate fluorescein staining. The anterior chamber was quiet. Subjective symptoms had settled and the patient was discharged with follow-up in the outpatient eye clinic. No abnormality was noted during the follow-ups. Four months after the injury (Figure 4), his left visual acuity was 6/6 with -2.00 dioptre and his right was 6/6 with -1.50 dioptre.

Soon after the accident, the plant was destroyed and removed from the garden by the parents. Part of the plant was brought to the authors (Figure 5).

THE EXPERIMENT

Materials and methods

Six rabbits of mixed breed (New Zealand white and local breed) supplied and maintained by the Central Animal House, University of Malaya, were used. Their eyes were normal on examination before the start of the experiment. The treatment for each eye was tabulated (Table I.) The experimental period was two weeks. No medication was given.

The design was such that the right eye of each

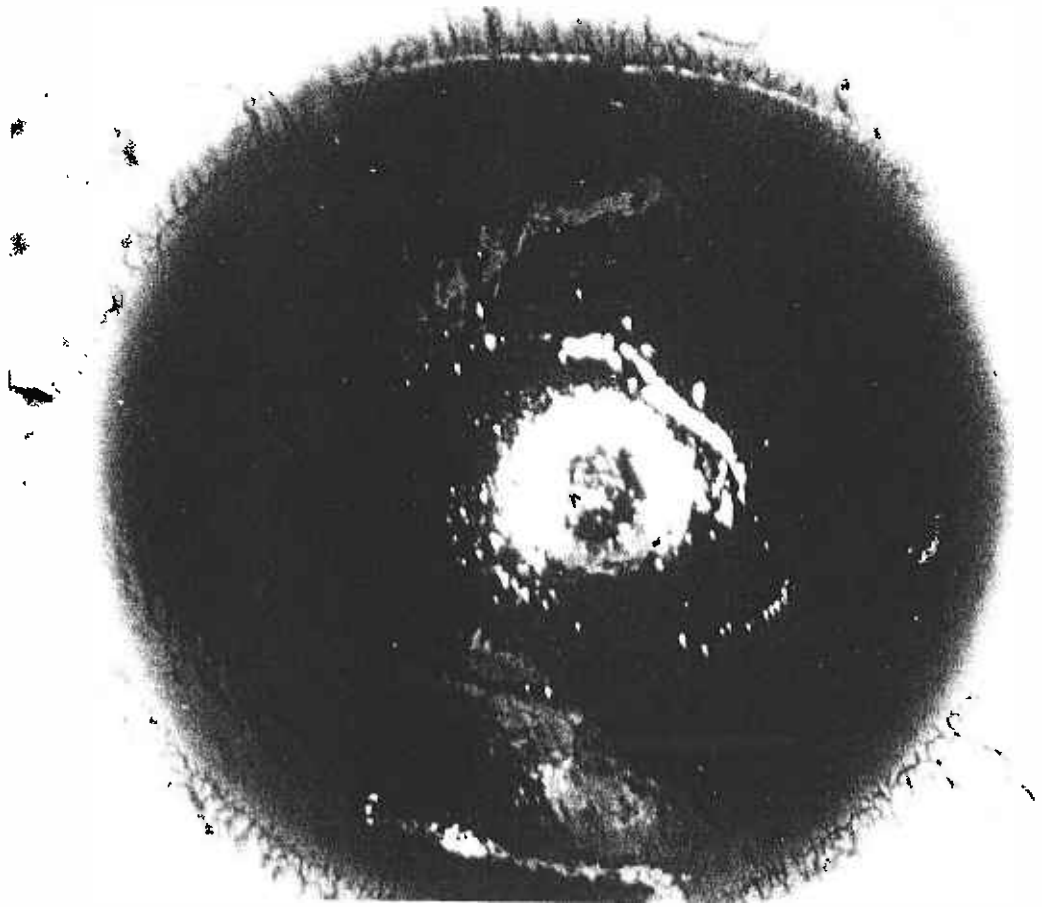

Figure 3

Corneal erosion as a result of a fall into the shrub. Note the oval edge of the healing corneal epithelium on the third day.

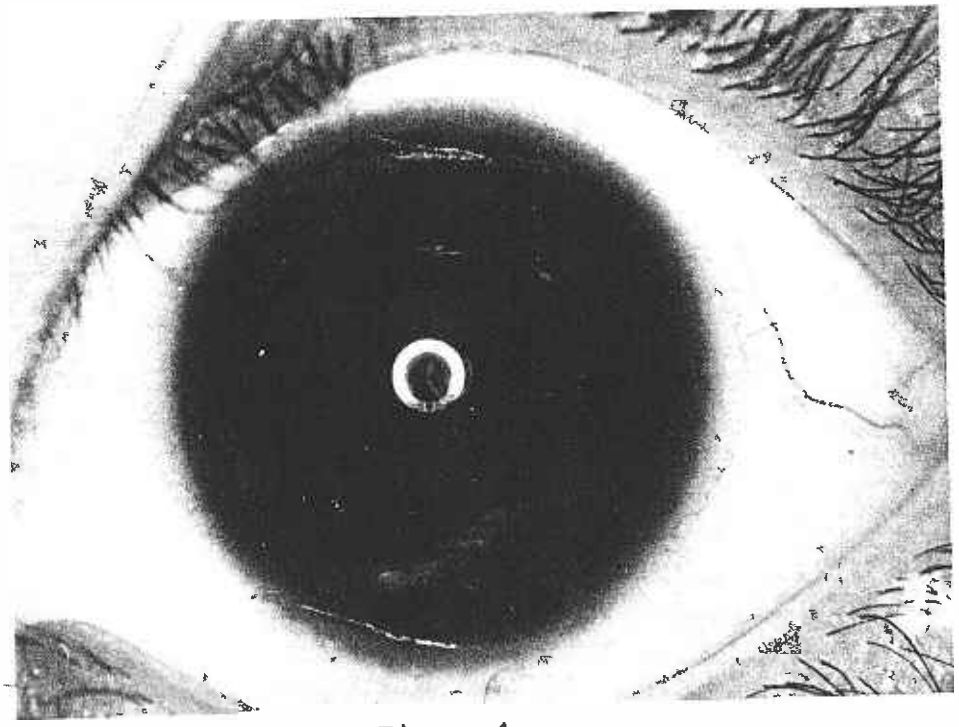

Figure 4

The eye of the patient four months after the injury. No abnormality noted.

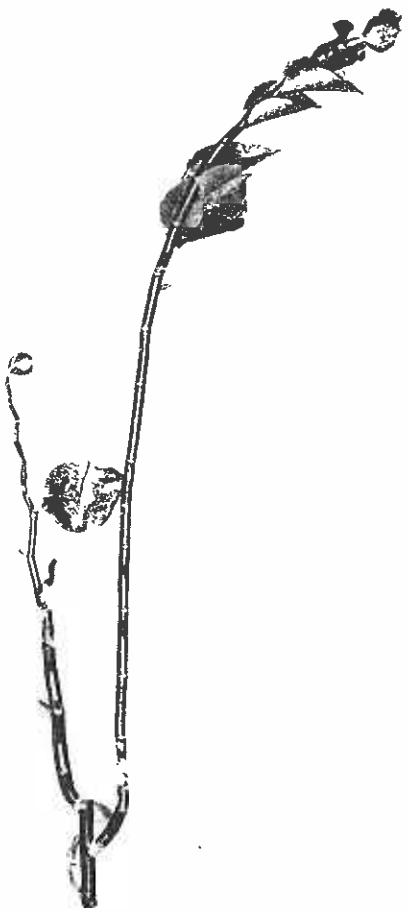

Figure 5

The part of the plant brought to the authors by the parent.

TABLE I
TREATMENT GIVEN TO EACH RABBIT

RABBIT	EYE	TREATMENT ADMINISTERED
Rabbit I	Right	Normal saline (pH6)
	Left	Plant sap
Rabbit II	Right	Corneal abrasion
	Left	Corneal abrasion followed by plant sap
Rabbit III	Right	Plant sap
	Left	Corneal abrasion followed by plant sap after washed with normal saline.
Rabbit IV	Right	Nothing instilled
	Left	Corneal abrasion
Rabbit V	Right	Plant sap
	Left	Water soluble extract
Rabbit VI	Right	Ethanol soluble extract
	Left	Petroleum soluble extract

rabbit was used as a control for its left eye, except for Rabbit V and VI. The eyes of Rabbit V and VI were used for comparative study. The pH of normal saline (eye drops) supplied by the Pharmacy of University Hospital was 6 (tested with Universalindikator of E. Merck, Darmstadt). Three drops of the plant sap were instilled directly into the eyes immediately after the leaves were broken off from the stems. Care was taken to prevent the eye being touched by the stems. The corneal abrasion was produced by using a stick of cotton bud soaked in absolute alcohol. Normal saline (eye drops) was used to irrigate the left eye of Rabbit III in order to wash away the residual alcohol before the plant sap was instilled. This was to prevent the possible interaction, if any, between the alcohol and the plant sap.

The three extracts, viz. water soluble, ethanol soluble and petroleum soluble, were fractionated from the plant sap. About 20 mg. of each extract (water soluble and ethanol soluble) was dissolved in 10 ml. of normal saline (eye drops). The petroleum soluble extract was applied directly onto the conjunctiva because it is insoluble in normal saline. The treatment was administered only once at the start of the experiment. On the first day, the rabbits were examined twice, thereafter daily examination was made.

RESULTS

The results of the experiment were recorded and are presented in Table II. The criterion for the healing of corneal abrasion is the absence of fluorescein staining of the cornea. White signifies the absence of congestion and fluorescein staining of the conjunctiva and cornea.

DISCUSSION

The pH of the plant sap was 6 and this was tested by using Universalindikator of E. Merck, Darmstadt. This pH was confirmed by the pH glass electrode method used by the Clinical Diagnostic Laboratory, University Hospital. The plant sap was observed to strongly agglutinate human red blood cells of all blood groups, and to digest an unexposed x-ray film, suggesting the presence of lectin in the former finding and proteolytic enzyme in the latter. (Unpublished observations of Dr. Ch'ng S.L., Department of Pathology, University of Malaya).

Rabbits were used in this experiment. The control eye of Rabbit I was instilled with normal saline of pH 6. No reaction was noted during the experimental period of 2 weeks. The plant sap caused moderately severe conjunctivitis with marked chemosis which lasted for eight to ten days. No corneal erosion was noted during the experimental period. However, the introduction of the plant sap into the rabbits' eyes which had been inflicted with corneal abrasion aggravated the inflammatory response and the abrasion took a longer period to recover, when compared with the eyes with corneal abrasion alone.

The constituents of the plant sap was fractionated into three parts; i) water soluble extract, ii) ethanol soluble extract and iii) petroleum soluble extract. The extracts were instilled into the rabbits' eyes. This produced mild conjunctivitis and chemosis which was much less severe than that due to the plant sap.

This animal experiment gives rise to the following conclusions:

i) the plant sap causes inflammation of the conjunctiva.

TABLE 2
RESULTS OF THE EXPERIMENT

RABBIT	EYE	RESULTS OF THE TREATMENT
Rabbit I	Right	Eye remained unchanged.
	Left	Immediate inflammation of conjunctiva. Marked chemosis within two hours after instillation. White on the eighth day. No corneal staining.
Rabbit II	Right	Moderately severe congestion on the second day. Corneal abrasion healed on the fifth day.
	Left	Very severe congestion of conjunctiva on the second day. Corneal abrasion healed on the tenth day.
Rabbit III	Right	Immediate inflammation of conjunctiva. Marked chemosis within two hours after instillaiton. White on the tenth day. No corneal staining.
	Left	Very severe congestion of conjunctiva on the second day. Corneal abrasion healed on the thirteenth day.
Rabbit IV	Right	Eye remained unchanged.
	Left	Moderate severe congestion on the second day. Corneal abrasion healed on the ninth day.
Rabbit V	Right	Immediate inflammation of conjunctiva. Marked chemosis within two hours after instillaon. White on the eighth day. No corneal staining.
	Left	Gradual onset of conjunctival congestion. Mild congestion and edema of conjunctiva on the second day. White on the sixth day. No corneal staining.
Rabbit VI	Right	Gradual onset of conjunctival congestion. Mild congestion and edema of conjunctiva on the second day. White on the eighth day. No corneal staining.
	Left	Gradual onset of conjunctival congestion. Mild congestion and edema of conjunctiva on the second day. White on the sixth day. No corneal staining.

ii) the plant sap aggravates the inflammatory reaction of the eye with corneal abrasion.
iii) the constituent responsible for the eye injury may consist of more than one compound. Probably a proteolytic enzyme is involved.

The above findings suggest that the eye injury of the patient was due to the combined effect of the plant sap and the mechanical trauma. The excruciating pain which the patient complained of initially was probably due to the plant sap. During the study, a hospital technician related a similar experience after the sap was introduced accidentally into his eye without any other injury three years ago. This incident occurred while he was cutting the plant. Immediate irrigation with tap water and subsequent topical treatment resulted in the disappearance of the symptoms after three days. He has been asymptomatic since.

The corneal erosion was probably the result of mechanical abrasion from the branches at the time of the fall and subsequent vigorous rubbing of the eyes. The effect of the plant sap might have produced total corneal erosion, which did not develop immediately after the fall but within twenty-four hours. It is also possible that the plant sap caused the cornea to be more susceptible to trauma. No dermatitis around the patient's eye was noted and this was confirmed by applying the sap onto the skin of the forearm of the author and a volunteer. No reaction was noted over a period of one week.

In view of the clinical findings and the results of the animal experiment, the first aid treatment should be an immediate irrigation of the affected eye with water under a tap and an immersion of the eye in a basin of clean water if it is available in order to wash away the sap. Subsequent trauma and further introduction of the sap from the contaminated hand should be avoided. An eye doctor should then be consulted to examine the extent of the injury, and to confirm that no plant sap is present in the eye. Further thorough irrigation with normal saline under local anaesthesia may be needed. Medical treatment will be symptomatic and the prevention of infection.

Although the follow-up period of the patient was only for four months, the long term complication of the eye injury, in this case, is unlikely because of the following reasons. Firstly, the immediate and effective first aid treatment administered would have prevented or markedly reduced any further injury of the eye by the plant sap. Secondly, the signs and symptoms were similar to those of corneal abrasion, suggesting the injury was confined to the superficial structure of the eye. Thirdly, the period of recovery from total corneal erosion was one week which was consistent with superficial involvement of the cornea. Fourthly, the short recovery period coupled with the absence of abnormal findings for four months indicates that it is unlikely complications would arise in the future.

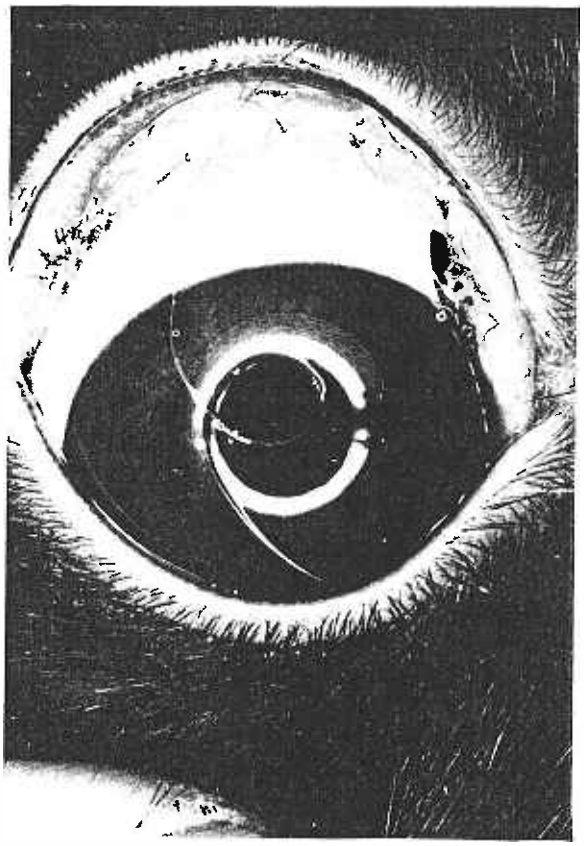

Figure 6

The right eye of Rabbit I with normal saline. The eye remained unchanged over the experimental period.

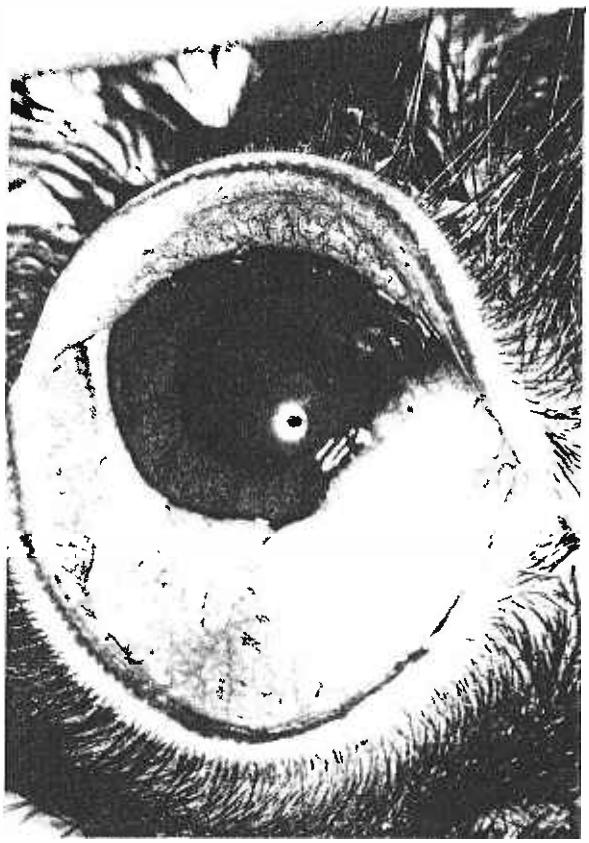

Figure 7

The left eye of Rabbit I twenty-four hours after the plant sap was introduced. Note the marked chemosis and congestion

CONCLUSION

A case of eye injury consisting of severe conjunctivitis with chemosis and corneal erosion as a result of contact with the sap of *Pedilanthus tithymaloides* has been described. The probable mechanism as demonstrated in the animal experiment is the result of the combined effect of the plant sap and the mechanical trauma. Proteolytic activity may be involved. Further studies and investigations need to be carried out to find out the constituents responsible for the injury. As this plant is a potential hazard to eyes, especially those of children, it should not be planted in places easily accessible to children, such as gardens and playgrounds. Eye goggles should be worn when cutting this type of plant.

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