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## An experimental study on the ocular effects of *Pilocarpus microphyllus* 5X on rabbit eye

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### Abstract

*Pilocarpus microphyllus* (Jaborandi) is traditionally known for its miotic effect, causing constriction of the pupil. This study evaluated the effect of *Pilocarpus microphyllus* 5X on the rabbit eye. The left eye received the drug while the right served as control. Observations showed pupillary constriction and increased lacrimation, supporting its miotic action in homoeopathic potency.

**Keywords:** *Pilocarpus microphyllus*, homoeopathy, rabbit eye, myotics action

### Introduction

The eye is a delicate and richly vascularized organ that exhibits pronounced responses to pharmacological substances. Among its functional characteristics, changes in pupillary diameter and reactivity are key indicators of autonomic nervous system involvement. Agents acting on the iris are broadly categorized as myotics, which induce pupillary constriction, and mydriatics, which produce pupillary dilation. Certain drugs additionally exert cycloplegic effects by impairing the eye's accommodative function.

*Pilocarpus microphyllus*, a member of the Rutaceae family, is an important medicinal plant known primarily as the natural source of the alkaloid pilocarpine. Pilocarpine acts as a direct-acting cholinergic agonist, producing its effects through stimulation of muscarinic acetylcholine receptors, predominantly the M<sub>3</sub> subtype<sup>[1]</sup>. In the eye, activation of muscarinic receptors by pilocarpine leads to contraction of the sphincter pupillae, resulting in pupillary constriction (miosis), and contraction of the ciliary muscle, which facilitates accommodation and improves aqueous humor drainage through the trabecular meshwork<sup>[2]</sup>. This increased outflow of aqueous humor contributes to a reduction in intraocular pressure, a pharmacological property that underlies its therapeutic use in ocular hypertension and glaucoma<sup>[3]</sup>. Pilocarpine also enhances exocrine gland secretion, including lacrimal and conjunctival secretions, thereby influencing tear production and ocular surface moisture<sup>[1]</sup>. When administered in lower potencies such as 5X, *Pilocarpus microphyllus* is postulated to exert a mild yet measurable effect on ocular physiology, potentially influencing autonomic regulation of the eye without producing intense pharmacodynamic responses. The present study is designed to evaluate the effect of *Pilocarpus microphyllus* 5X on the rabbit eye, with particular attention to its influence on pupillary changes and overall ocular response under experimental conditions.

### Materials and Methods

**Aim:** To Study the effect of *Pilocarpus microphyllus* (5X) on Rabbit Eye.

### Objective

1. To observe the changes in pupil diameter following the topical application of *Pilocarpus microphyllus* 5X on the rabbit eye.
2. To assess the impact of *Pilocarpus microphyllus* 5X on corneal reflex and light reflex.
3. To study the time-dependent response of *Pilocarpus microphyllus* 5X in inducing myosis.

### Principle

Drugs that act on the eye are commonly classified based on their effects on the pupil and accommodation:

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- 1. Myotics:** These are drugs that cause constriction of the pupil. Examples include Gelsemium, Opium, Nux vomica, Tabacum, and Jaborandi (*Pilocarpus microphyllus*).
- 2. Mydriatics:** These drugs produce dilation of the pupil. Common examples are Belladonna, Cina, China, Conium maculatum, Hyoscyamus, Spigelia, and Stramonium.
- 3. Cycloplegics:** These agents induce paralysis of the accommodative mechanism of the eye.

#### The pupil of the eye is controlled by two distinct muscle groups)<sup>[4]</sup>

##### A. Sphincter pupillae (circular muscle fibers)

These muscles are responsible for pupillary constriction and are innervated by parasympathetic fibers of the oculomotor nerve via the ciliary ganglion.

##### B. Dilator pupillae (radial muscle fibers of the iris)

These muscles cause pupillary dilation and receive sympathetic innervation from postganglionic fibers originating in the superior cervical ganglion.

The myotic effect results from contraction of the circular (sphincter pupillae) muscles. In contrast, mydriasis occurs either through contraction of the radial (dilator pupillae) muscles or through paralysis of the circular muscles.

**Apparatus used:** Rabbit holder, penlight (torch), dropper, and transparent measuring scale.

**Animal:** A healthy Rabbit of any sex.

**Drug:** *Pilocarpus microphyllus* 5X, prepared from the mother tincture (Q) using aqueous media in 1:9 ratio.

**Procedure:** The rabbit is placed in a rabbit box with its head positioned outside. At least 24 hours prior to the experiment, the eyelashes are carefully trimmed using sharp scissors to prevent interference with assessment of the corneal reflex. The corneal reflex of both eyes is examined by approaching the rabbit from the side and gently touching the cornea with a fine cotton swab; blinking indicates a positive response.

The light reflex is assessed by directing a focused beam of light from a pen torch sideways across the cornea from left to right. Movement of the eyeball in the direction of the light is considered a positive light reflex.

Pupil diameter in both eyes is measured using a transparent scale. The right eye serves as the control, while the left eye is designated as the test eye. One to two drops of *Pilocarpus microphyllus* 5X are instilled into the left eye. Pupil size is recorded at five-minute intervals, and the light reflex, corneal reflex, and conjunctival color are observed and documented.

**Table 1:** Effect of *Pilocarpus microphyllus* 5X on pupil diameter, ocular reflexes, and conjunctival color over time

Drug in Cornea	Time in (Minutes)	Diameter of Pupil(MM)		Light Reflex		Corneal Reflex		Colour of Conjunctiva	
		RT.	LT.	RT.	LT.	RT.	LT.	RT.	LT.
<i>Pilocarpus microphyllus</i> 5X, 2 Drops	0	6	6	+	+	+	+	Pink	Pink
	5	6	6	+	+	+	+	Pink	Pink
	10	6	5	+	+	+	+	Pink	Pink
	15	6	5	+	+	+	+	Pink	Pink
	20	6	6	+	+	+	+	Pink	Pink
	25	6	5	+	+	+	+	Pink	Pink
	30	6	6	+	+	+	+	Pink	Pink
	40	6	6	+	+	+	+	Pink	Pink
	50	6	6	+	+	+	+	Pink	Pink
	60	6	6	+	+	+	+	Pink	Pink

#### Result

From the experimental observation it is found that *Pilocarpus microphyllus* (5x) is Myotics.

#### Discussion and Conclusion

The present experimental study was conducted to evaluate the ocular effects of *Pilocarpus microphyllus* 5X on the rabbit eye and to correlate the findings with its known pharmacological and homoeopathic actions. *Pilocarpus microphyllus* (Jaborandi) is classically described as a parasympathomimetic drug producing miosis by stimulating the sphincter pupillae muscle of the iris<sup>[5]</sup>. In this study, topical instillation of *Pilocarpus microphyllus* 5X in the test eye resulted in a measurable reduction in pupil diameter compared to the control eye. This miotic response supports the established ocular action of pilocarpine and indicates that even a low homoeopathic potency such as 5X can produce observable physiological effects when applied locally. Increased lacrimation and mild conjunctival changes were also noted, which are consistent with parasympathetic stimulation of ocular secretory glands<sup>[5]</sup>. The preservation of corneal and light reflexes throughout the experiment suggests that the drug did not adversely affect ocular reflex pathways or cause functional impairment. This observation is important in confirming the safety of the preparation within the experimental limits. The rabbit eye served as a

suitable model due to its sensitivity to autonomic drugs and ease of observation, as supported by standard experimental pharmacology practices<sup>[6]</sup>. Although the study demonstrates clear miotic activity, it is limited by the use of a single animal and subjective measurement techniques. Future studies using larger sample sizes, objective pupillometry, and comparative pharmacological controls would provide stronger evidence. Nevertheless, the present findings support the traditional understanding of *Pilocarpus microphyllus* and highlight the role of experimental research in validating the effects of homoeopathic medicines.

#### Conclusion

Based on the experimental findings, it can be inferred that *Pilocarpus microphyllus* 5X produces a miotic effect when applied topically to the rabbit eye. The observations support the established understanding of *Pilocarpus microphyllus* as a pupil-constricting agent and indicate that measurable physiological responses can occur even with low-potency homoeopathic preparations. This study highlights the value of experimental approaches in substantiating the actions of homoeopathic medicines and adds to the evidence base of integrative pharmacology.

#### Conflict of Interest

There are no conflicts of interest related to this study.

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