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RESEARCH ARTICLE

INFLUENCE OF DIFFERENT CONCENTRATIONS OF GA_3 ON SEED GERMINATION IN CORYNANDRA FELINA (L.F.) COCHRANE & ILTIS

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Abstract

Corynandra felina (L.f.) Cochrane & Iltis [= *Cleome felina* L.f.] is an endemic medicinal herb of Peninsular India with considerable therapeutic potential. However, its propagation is restricted by poor and erratic seed germination resulting from seed dormancy, leading to inadequate field establishment. The present study investigated the effect of different concentrations of gibberellic acid (GA_3) on seed germination in *Corynadra felina*. Seeds were pre-soaked in GA_3 solutions at concentrations of 0.5, 1.0, 1.5, and 2.0 mg L^{-1} for 24, 48, and 72 h before sowing under laboratory conditions. Germination percentage and mean germination time were recorded to evaluate the effectiveness of the treatments. GA_3 significantly enhanced seed germination compared with the untreated control. Among the treatments tested, 1.0 mg L^{-1} GA_3 applied for 72 h produced the highest germination percentage (18.5%). Although higher GA_3 concentrations also improved germination relative to the control, they did not provide additional benefits and were associated with a slight reduction in germination performance. The findings demonstrate that an optimum concentration of GA_3 effectively alleviates seed dormancy and enhances seed germination in *Corynandra felina.* The optimized protocol developed in this study provides a practical approach for improving propagation, supporting *ex situ* conservation,and facilitating the sustainable utilization of this endemic medicinal specie

Introduction:-

Corynandra felina (L.f.) Cochrane & Iltis [=*Cleome felina* L.f.], a member of the family Cleomaceae, is commonly known as the cat spider flower. The species is endemic to Peninsular India and has been reported from several parts of the region (Sundararagavan, 1993; Kundu *et al*., 2007; Rawat et al., 2008). Owing to its diverse pharmacological properties, *Corynandra felina* occupies an important place in traditional medicine. The entire plant has been used as an astringent (Nadkarni, 1954), while its seeds have been administered as a vermifuge in traditional medicinal practices (Baillon, 1874). Previous studies have demonstrated that extracts of the whole plant possess antidiabetic and antihyperglycaemic activities (Nagarajan et al., 2005). Furthermore, the ethanolic leaf extract has been reported to exhibit significant anticancer potential (Mahimadoss et al., 2014). In addition, the species has been shown to possess anti-inflammatory, antimicrobial, and anticancer properties, highlighting its considerable therapeutic value (Vijayashalini and Abirami, 2018). The increasing medicinal importance of *Corynandra felina* has resulted in

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extensive harvesting from natural populations by local herbal practitioners. Continuous and unregulated collection, coupled with habitat degradation, has substantially reduced its natural populations, making the species increasingly vulnerable and emphasizing the need for effective conservation and propagation strategies.

Seed germination represents a crucial phase in the plant life cycle, determining successful seedling establishment, population regeneration, and long-term survival. However, the conservation and large-scale propagation of *Corynandra felina* are hindered by poor and erratic seed germination, primarily due to seed dormancy. Dormancy restricts timely germination and consequently reduces seedling establishment under natural conditions. Various seed pretreatment methods, particularly the application of plant growth regulators, have been successfully employed to overcome dormancy and improve germination in several medicinal plant species. Among these, gibberellic acid (GA_3) is one of the most effective growth regulators, promoting germination by inducing the synthesis of hydrolytic enzymes such as α-amylase, facilitating the mobilization of stored food reserves, and stimulating embryo growth. In view of these considerations, the present study was undertaken to investigate the effect of different concentrations of GA_3 on seed germination and early seedling growth in *Corynandra felina,* with the objective of developing an efficient protocol for enhancing propagation and supporting the conservation of this valuable endemic medicinal species.

Material and Methods:-

Plant Material and Seed Collection:-

Healthy one-month-old plants of *Corynandra felina* (L.f.) Cochrane & Iltis were collected from Gopalapuram, Hanamkonda District, Telangana, India (18.0212° N, 79.5359° E). The collected specimens were identified and authenticated, and voucher plants were established and maintained in the Botanical Garden, Department of Botany, Osmania University, Hyderabad, Telangana, India (17.4135° N, 78.5287° E). Mature black seeds were harvested from fully ripened fruits of *Corynandra felina*. The seeds were shade-dried for 72 h and subsequently stored in screw-capped glass bottles at room temperature until further use.

GA_3 Treatment and Germination Experiment:-

Prior to sowing, the seeds were soaked in aqueous solutions of gibberellic acid (GA_3) at concentrations of 0.5, 1.0, 1.5, and 2.0 mg L^{-1} for three treatment durations 24, 48, and 72 h. Untreated seeds served as the control. Following treatment, the seeds were sown in medium-sized pots containing a sterilized potting mixture of vermicompost, red soil, and sand in a 2:1:1 ratio. Each pot was sown with 50 seeds, and every treatment was replicated three times. The pots were maintained under suitable environmental conditions, and germination was monitored regularly throughout the experimental period.

Germination Assessment:-

Seed germination percentage was calculated using the following formula:-

$$P = (G/T) \times 100$$

Where:-

P = Germination percentage
T = Total number of seeds sown
G = Number of germinated seeds

The mean germination percentage for each treatment was calculated from three independent replicates and used for statistical analysis.

Results:-

Effect of GA_3 on Seed Germination:-The effect of different concentrations of gibberellic acid (GA_3) on the *in vivo* germination of *Corynandra felina s*eeds was evaluated after seed soaking for 24, 48, and 72 h. Germination percentage increased progressively with increasing treatment duration and varied according to GA_3 concentration (Table 1; Fig. 1 and 2).Untreated (control) seeds exhibited a low germination percentage of 4.3%, indicating the presence of seed dormancy. In contrast, GA_3 treatment significantly improved germination compared with the control. Among the concentrations tested, 1.0 mg L^{-1} GA_3 was the most effective, producing germination percentages of 11.7%, 16.4%, and 18.5% after 24, 48, and 72 h of treatment, respectively. The highest germination (18.5%) was recorded following treatment with 1.0 mg L^{-1} GA_3 for 72 h. Lower GA_3 concentration (0.5 mg L^{-1}) resulted in comparatively lower germination percentages of 5.7%, 6.2%, and 10.0% after 24, 48, and 72 h, respectively. Increasing the concentration beyond the optimum (1.5 and 2.0 mg L^{-1}) did not further enhance

germination. Seeds treated with 1.5 mg L^{-1} GA_3 showed germination percentages of 9.7%, 12.8%, and 14.4%, whereas those treated with 2.0 mg L^{-1} exhibited 6.2%, 8.2%, and 10.2% germination after 24, 48, and 72 h, respectively. Overall, seed germination improved with increasing soaking duration up to 72 h, and 1.0 mg L^{-1} GA_3 proved to be the optimum concentration for overcoming seed dormancy and enhancing germination in *Corynandra felina.* Higher GA_3 concentrations did not confer additional benefits and instead resulted in a slight decline in germination percentage.

Table 1. Effect of different concentrations of GA_3 and soaking durations on the *in vivo* seed germination percentage of *Corynandra felina.*

Treatment	GA_3 Conc. (mg L^{-1})	Percentage of germination		
		24 Hrs	48 Hrs	72 Hrs
Control	-	4.3		
GA_3	0.5	5.7	6.2	10
	1.0	11.7	16.4	18.5
	1.5	9.7	12.8	14.4
	2.0	6.2	8.2	10.2

Values represent the mean germination percentage. Each experiment done with 50 seeds and each experiment repeats three times.

Fig. 1. a). Field grown *Corynandra felina* plant b). Mature open fruit with seeds c). Mature seeds d, e & f). Seedlings

Discussions:-

Seed germination is the first and one of the most critical stages in the life cycle of a plant, determining successful seedling establishment and subsequent population regeneration (Bewley, 1997). However, germination is often influenced by seed dormancy, a physiological condition in which viable seeds fail to germinate even under favourable environmental conditions (Bewley and Black, 1994). Dormancy serves as an adaptive mechanism that prevents premature germination but also poses a major challenge for the propagation and conservation of many medicinal and endemic plant species. The seed coat contributes to dormancy by restricting the uptake of water and oxygen and by mechanically limiting radicle emergence. Various pre-sowing treatments, including water soaking, mechanical scarification, and the application of plant growth regulators, have been widely employed to overcome dormancy and improve germination (Madushani et al., 2019). Among plant growth regulators, gibberellic acid (GA_3) is recognized as one of the most effective dormancy-breaking agents. GA_3 promotes seed germination by counteracting the inhibitory effects of abscisic acid (ABA), stimulating embryo growth, and inducing the synthesis of hydrolytic enzymes, particularly α-amylase, which mobilize stored food reserves required for embryo development (Debeaujon and Koornneef, 2000). Consequently, exogenous application of GA_3 has been reported to improve germination in several plant species (El-Barghathi and El-Bakosh, 2005). Information on seed dormancy and germination biology within the genera *Cleome* and *Corynandra* remains limited. Previous investigations have reported generally poor germination in several species of these genera (Ochuodho and Modi, 2007; Raboteaux and Anderson, 2010).

Physiological dormancy has been documented in *Cleome lutea, C. serrulata*, and *C. hassleriana* (Cane, 2008), suggesting that dormancy is a common characteristic within the group. Such dormancy may result from factors including a relatively hard seed coat, incomplete embryo development, or hormonal regulation mediated primarily by abscisic acid (ABA) (Bewley and Black, 1994). The present investigation demonstrated that GA_3 treatment significantly enhanced seed germination in *Corynandra felina* compared with untreated seeds. Seeds exposed to GA_3 initiated germination within three days, whereas untreated seeds began germinating only after seven days, indicating that GA_3 effectively accelerated the germination process. Similar observations have been reported by Balaguera-Lopez et al. (2008), who demonstrated that GA_3 treatment hastened seed germination in dormant seeds. The untreated control exhibited a low germination percentage (4.3%), confirming the presence of strong seed dormancy in *Corynandra felina.* Both GA_3 concentration and soaking duration markedly influenced germination. Among the treatments evaluated, soaking seeds in 1.0 mg L^{-1} GA_3 for 72 h resulted in the highest germination percentage (18.5%). Lower concentrations were less effective, while concentrations above the optimum (1.5 and 2.0 mg L^{-1}) failed to produce further improvement and slightly reduced germination. These findings suggest that an optimal level of GA_3 is required to stimulate germination, whereas excessive concentrations may not provide additional physiological benefits.

The enhanced germination observed following GA_3 treatment is likely attributable to improved penetration of the hormone into the seed tissues and activation of metabolic processes associated with embryo growth (Mathur et al., 1971). Gibberellins are known to promote the expression of hydrolytic enzymes, accelerate reserve mobilization, and facilitate radicle protrusion, thereby overcoming physiological dormancy. Similar mechanisms have been reported in *Arabidopsis thaliana,* where GA_3 effectively releases seed dormancy and promotes germination (Ouyang et al., 2000). Overall, the findings of the present study demonstrate that pre-soaking *Corynandra felina* seeds in 1.0 mg L^{-1} GA_3 for 72 h is the most effective treatment among those tested for improving seed germination. This protocol offers a practical and efficient approach for enhancing the propagation, cultivation, and *ex situ* conservation of this endemic medicinal species.

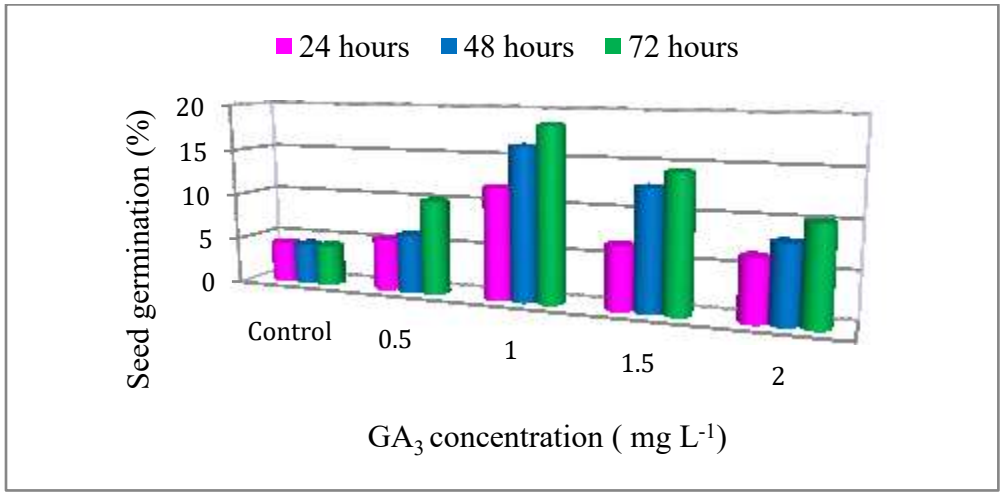

Fig. 2 Effect of GA3 concentration on *in vivo* seed germination in *Corynandra felina*

Conclusions:-

The present study demonstrated that gibberellic acid (GA_3) effectively enhances the *in vivo* seed germination of *Corynandra felina*. Untreated seeds exhibited a low germination percentage (4.3%), confirming the presence of pronounced seed dormancy; whereas seeds treated with 1.0 mg L^{-1} GA_3 achieved the highest germination percentage (18.5%). The results indicate that GA_3 is effective in breaking seed dormancy and promoting germination, when applied at an optimum concentration. Among the treatments evaluated, soaking seeds in 1.0 mg L^{-1} GA_3 for 72 h proved to be the most effective protocol for improving germination.

These findings provide a simple, economical, and reliable method for enhancing seed propagation of *Corynandra felina*. The optimized GA_3 treatment can be employed for large-scale multiplication, *ex situ* conservation, and sustainable utilization of this endemic medicinal species. Further studies on additional dormancy-breaking techniques and field establishment of seedlings may help develop comprehensive conservation strategies for *Corynandra felina.*

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References:-

1. Baillon, H. 1874. The Natural History of Plants. Reeve & Company, London, England
2. Balaguera-Lopez, H. E., Cardenas-Hernandez, J. F. and Alvarez-Herrera, J. G. (2008). Effect of gibberellic acid (GA3) on seed germination and growth of tomato (Solanum lycopersicum L.). In International Symposium on Tomato in the Tropics, Acta Hortic., 821: 141-148. https://doi.org/10.17660/ActaHortic.2009.821.15
3. Bewley, J. D. (1997). Seed germination and dormancy. The plant cell, 9(7): 1055-1066. https://doi.org/10.1105/tpc.9.7.1055
4. Bewley, J. D., Black, M., Bewley, J. D. and Black, M. (1994). Dormancy and the control of germination. Seeds physiology of development and germination, 199-271. https://doi.org/10.1007/978-1-4899-1002-8_5
5. Cane, J. H. (2008). Breeding biologies, seed production and species-rich bee guilds of Cleome lutea and Cleome serrulata (Cleomaceae). Plant Species Biology, 23(3): 152-158. https://doi.org/10.1111/j.1442-1984.2008.00224.x
6. Debeaujon, I. and Koornneef, M. (2000). Gibberellin requirement for Arabidopsis seed germination is determined both by testa characteristics and embryonic abscisic acid. Plant physiology, 122(2), 415-424. https://doi.org/10.1104/pp.122.2.415

7. EL-Barghathi, M.F. and El-Bakkosh, A. 2005. Effect of some mechanical and chemical pretreatments on seed germination and seedling growth of Quercus coccifera (Kemes oaks). J. Jerash Private Univ. (in press).11(1): 1-13.
8. Kundu, S.R. 2007. A compendium of Brassicaceae in Indian subcontinent: Its distribution and endemism. Thaiszia Journal of Botany, 17:59-95.
9. Madushani, K. P. K., Amarasinghe, M. D., Ratnayake, R. M. C. S. and Dahanayaka, D. D. G. L. (2019). In-vitro and in-vivo Seed Germination Percentage of Typha angustifolia. International Postgraduate Research Conference 2019, Faculty of Graduate Studies, University of Kelaniya, Sri Lanka. P. 59. Date: 2019. http://repository.kln.ac.lk/handle/123456789/20957
10. Mahimaidoss, J., Vincent, A. and Antony, C. 2014. The anticancer activity of ethanolic extract of Cleome felina L. Journal of Pharmacy Research, 88:1223-1225.
11. Mathur, D. D., Couvillon, G. A., Vines, H. M. and Hendershott, C. H. (1971). Stratification effects on endogenous Gibberellic Acid (GA) in Peach seeds. Hort Science, 6(6), 538-539. https://doi.org/10.21273/HORTSCI.6.6.538
12. Nadkarni, A. 1976.Nadkarni's Indian Materia Medica, Popular Prakashan Pvt. Ltd., Bombay, India.
13. Nagarajan, N.S., Murugesh, N., Kumaresan, P.T., Radha, N. and Murali, A. 2005. Antidiabetic and antihyperlipemic effects of Cleome felina. Fitoterapia, 76(3-4): 310-315. https://doi.org/10.1016/j.fitote.2005.03.020
14. Ochuodho, J. O. and Modi, A. T. (2007). Light-induced transient dormancy in CleomegynandraL. seeds. African Journal of Agricultural Research, 2(11): 587-591.
15. Ouyang, J., Shao, X. and Li, J. (2000). Indole-3-glycerol phosphate, a branch point of indole-3-acetic acid biosynthesis from the tryptophan biosynthetic pathway in Arabidopsis thaliana. The Plant Journal, 24(3): 327-334. https://doi.org/10.1046/j.1365-313x.2000.00883.x
16. Raboteaux, N. G. and Anderson, N. O. (2010). Germination of Cleome hassleriana and Polanisiadodecandra seed lots in response to light, temperature and stratification. Research Journal of Seed Science, 3(1), 1-17. https://doi.org/10.3923/rjss.2010.1.17
17. Rawat, G.S. (ed.). 2008. Special habitats and threatened plants of India, wildlife and protected areas, wildlife institute of India, Dehradun, India. ENVIS Bulletin, 11(1): 239.
18. Sundararaghavan, R. 1993. Capparaceae. pp. 248-335.In: Flora of India, Vol.2 (eds. B.D. Sharma and N.P. Balakrishna). Botanical Survey of India, Calcutta, West Bengal, India.
19. Vijayashalini, P. and Abirami, P. 2018. Diversity of medicinal plants in Eratti hill, Thamaraikarai beat of Bargur reserve forest, Western Ghats in Erode district, Tamil Nadu, India. Asian Journal of Pharmaceutical and Clinical Research, 11(10):78-85. https://doi.org/10.22159/ajpcr.2018.v11i10.27905