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Short Communication

Improvement in Seed Germination of *Grewia tenax* (Forsk.) Fiori by Providing Different Nitrate Pretreatments

Kshan Prabha Sahoo and Pawan K. Kasera*

Laboratory of Plant Ecology, Department of Botany, Jai Narain Vyas University, Jodhpur 342 033, India

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Grewia tenax (Forsk.) Fiori (Family: Tiliaceae), commonly known as gangan, the fruits and stems of which are used for various purposes. Depending on the nutrient and mineral contents of the traditional fruits, it could be an important contributor to meet the nutritional requirements of rural and urban people (Mohammed Elhassan and Yagi, 2010). Seed germination is important to maintain the life cycle of a plant. However, dormancy in seeds due to the environmental conditions decreases germination. A large number of pretreatments such as mechanical and acid scarifications, light, chilling, temperature, nitrates, growth regulators, etc., have been attempted to break dormancy and to hasten germination (Sen, 1977). Among various chemicals, nitrate is known to influence germination of many desert species (Kasera and Sen, 1992). No literature is available on seed germination aspects on this species. The present investigation was undertaken to break the dormancy in *G. tenax* by using chemicals.

Mature seeds of *G. tenax*, collected from Machia Safari Park, Jodhpur (11 km away in north-west direction from the University Campus), during 2007-2009, were stored in plastic containers with parad tablets. The seeds were cleaned and treated with 0.1% $HgCl_2$ for 30 seconds and kept under running tap water for 3-4 hours to remove chemical. Since coated fresh and one-year-old seeds did not germinate, decoated seeds were presoaked for 24 h in different concentrations (25, 50 and 100 mg L^{-1}) of KNO_3, $Co(NO_3)_2$ and NH_4NO_3 and placed in sterilized petridishes lined with single layer of filter paper moistened with distilled water in seed germinator at 28°C. The experiments were carried out in alternate white light and dark (12 h) obtained from 3 fluorescent tubes of 40 watts each fitted at a height of half meter from the petridishes (1000 lux). Each petridish contained 10 seeds. The experiments were performed in triplicate using CRD design separately during both the years and the data were statistically analyzed by one-way ANOVA as per Gomez and Gomez (1984). The germination (%), seedling growth, R/S ratio, germination value (GV) and plant vigor index (VI) were recorded after 10 days. GV and VI were calculated as described by Czabator (1962) and Abdul-Baki and Anderson (1973), respectively.

G. tenax exhibited maximum (46.67%) germination in 25 mg L^{-1} NH_4NO_3 pretreatment in one-year-old seeds, while fresh decoated seeds had 40.0% germination. Seedling growth were maximum in 50 mg L^{-1} KNO_3 in fresh and one-year-old decoated seeds. Highest VI (198.64 in fresh seeds and 208.66 in one-year-old seeds) was observed in 25 mg L^{-1} NH_4NO_3. Highest GV was found in 25 mg L^{-1} of $Co(NO_3)_2$ in one-year-old seeds. In the present study, all the parameters showed significant differences among different treatments ($P<0.05$).

Seeds of most of the desert plant species indicated a high germination percentage after providing certain pretreatments (Sen, 1977). The purpose of giving pretreatment is to stimulate the germination. Seed pretreatment with nitrate solutions, softens the seed coat and reducing the time required for germination. Certain kinds of pretreatments are essential for good germination, otherwise seeds may not germinate at all or give poor germination or delay seed germination (Chemexcil, 1992). Kasera and Sen (1987) observed that 50 ppm of NH_4NO_3 enhanced the germination in one-year-old seeds of *Borreria articularis*. According to Choudhary and Kumar (2003) nitrogen sources such as KNO_3 and NH_4NO_3 at lower concentrations promoted seed germination and seedling growth in *Plantago ovata*, but inhibited at higher ones. Swami *et al.* (2011) observed 100% germination and maximum root and shoot lengths in fresh seeds with 0.75% NH_4NO_3

*E-mail: jnvupkkasera@yahoo.co.in

Table 1. Effect of different nitrates on seed germination and seedling vigor parameters in fresh (F) and one-year-old seeds (O) of G. tenax (Observations taken 10 days after setting the experiments)

Pretreatments		Germination (%)		Seedling growth (cm)				R/S Ratio		Plant vigour index		Germination value	
		F	O	Root length		Shoot length		F	O	F	O	F	O
				F	O	F	O						
Control		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KNO_3 (mg L^{-1})	25	0.00	13.33	0.00	2.30	0.00	3.05	0.00	0.75	0.00	71.32	0.00	8.88
	50	6.67	20.00	2.00	2.20	1.00	2.73	2.00	0.81	20.01	98.60	1.113	20.00
	100	0.00	13.33	0.00	1.10	0.00	1.85	0.00	0.59	0.00	39.32	0.00	17.77
NH_4NO_3 (mg L^{-1})	25	40.00	46.67	2.13	1.66	2.83	2.81	0.75	0.59	198.64	208.66	53.32	108.90
	50	6.67	20.00	1.20	0.70	1.50	1.07	0.80	0.65	18.01	35.34	1.48	20.00
	100	13.33	20.00	1.10	1.033	1.45	1.53	0.76	0.67	33.99	51.32	4.44	40.00
$Co(NO_3)_2$ (mg L^{-1})	25	13.33	40.00	2.20	1.10	3.75	2.07	0.59	0.53	79.31	126.68	4.44	160.00
	50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	100	0.00	6.67	0.00	0.20	0.00	1.20	0.00	0.17	0.00	9.34	0.00	2.224
CD at 5% P		0.006	0.004	0.689	0.002	0.002	0.03	0.001	0.029	4.538	17.676	3.605	3.751

solution in *Withania somnifera.* The fresh seeds of *Withania coagulans* exhibited maximum 90% germination in 0.10% concentration of $CoNO_3$, while one-year-old seeds showed 100.0% germination in 0.75% of NH_4NO_3 and 0.50% $CaNO_3$ solutions (Gehlot and Kasera, 2011). The present findings also support above-mentioned results observed by various workers.

The seeds of *G. tenax* are nitrophilous in nature as they exhibited enhanced germination when pretreated with nitrate solutions. We conclude that for fast multiplication of this plant decoated seeds should be pretreated with 25 mg L^{-1} of NH_4NO_3 to get higher germination.

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