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SHORT COMMUNICATION

Note on Occurrence of Fragrant False Garlic [*Nothoscordum gracile* (Aiton) Stearn] in India

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Fragrant false garlic [*Nothoscordum gracile* (Aiton) Stearn] belonging to family Alliaceae is an ornamental species native to southern Mexico and western South America, and widely naturalized in many parts of the world. In this paper a note on occurrence of the species in parts of Himalaya, Nagaland and Punjab along with occasional use as ornamental was presented. Besides, note on botany, mode of propagation and weedy potential of the species in India using weed risk assessment technique is included.

Key Words: Distribution, Fragrant false garlic, *Nothoscordum gracile*, Potential weed, Weed risk analysis

Gardening industry is the largest importer of introduced plant species and also the dominant source of naturalised plants having weedy potential (Groves *et al.,* 2005). Fragrant false garlic or onion weed [taxonomically known as *Nothoscordum gracile* (Aiton) Stearn] is one such species native to southern Mexico and western South America, and widely naturalised in many parts of the world (Ravenna, 1991). This species belongs to the family Alliaceae, subfamily Allioideae and has resemblance to genus *Allium* but it lacks any onion or garlic odour when crushed. It is economically important as an ornamental species and introduced as a garden plant to different continents across the world; also reported for edible use. Due to extremely prolific and invasive behaviour it is difficult to eradicate and therefore poses high risk associated with its escape from gardens and naturalization. Among many introduced plant species under cultivation in home garden, the fragrant false garlic is reported to naturalise in parts of India. Since this species is not commonly known, the botany of the plant is discussed below:

Nothoscordum gracile (Aiton) Stearn [syn. *Allium gracile* Aiton (basionym), *A. fragrans* Vent., *A. inodorum* auct., *Nothoscordum fragrans* (Vent.) Kunth, *N. inodorum* auct.]: bulb ovoid, about 1.5 cm diameter, outer coats brown, bulblet over 50; leaf basal, 4-10, linear, flat, 25-30 × 0.4-1 cm, glabrous, sheathing at the base, die back from the tip before flower maturity; scape 1or 2, terete, semi-erect, 30-60 × 0.2-0.3 cm; umbel 10-15-flowered, loosely arranged, often asymmetrical, bract persistent, two, 1.2-2 × 0.5-0.8 cm, flower fragrant, bell-shaped, with greenish bases and reddish to brown mid veins on outer side of perianth, 8-15 mm long, tepal white, oblanceolate, apex obtuse, bases fused; anther dark brown, filament simple, adnate to tepals, 7-10 mm, style persistent in fruit, equalling stamens, stigma unlobed; capsule obovoid, 6-7 × 6-7 mm; seed 8-12 per locule, black, tear drop-shaped (one end pointed), 2-4 × 1-2 mm.

During study on genetic resources of *Allium* in India the first author came across an onion like plant growing in the experimental garden, ICAR-NBPGR, New Delhi. Critical study of the material for identity was undertaken using herbarium specimens housed in national herbaria – the Botanic Survey of India (BSI), Forest Research Institute (FRI), Dehradun and National Herbarium of Cultivated Plants (NHCP), ICAR-NBPGR, New Delhi. After confirmation of identification from

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Fig. 1. ***Nothoscordum gracile*** **(top: from left-right): uprooted plants of fragrant false garlic; seedlings arising from perennating bulblets; open flower; (bottom: from left-right): false bulb; seedlings; bulblets; seeds**

various national herbaria and digital images available with online herbaria the species was identified as *Nothoscordum gracile*.

Material was grown in experimental garden of ICAR-NBPGR, New Delhi and studied from seedling to maturity stage during the year 2013 to 2015. Observations were recorded at different growth stages for morphological characters and on mode of propagation. Information on distribution and use was primarily based on authors' field experience and herbarium study. Vouchers specimens (HS21510; HS18539; HS21669) and seed samples (IC383446; SS3043, SS3045) have been deposited in the National Herbarium of Cultivated Plants, NBPGR, New Delhi.

Original material was collected from Munshiyari in Uttarakhand (which in turn was brought from Arunachal Pradesh) and reported for edible use; it was earlier misidentified as *Allium clarkei* Hook.f. (see Negi *et al.*, 2006). The same was maintained in the field gene bank at Bhowali, Uttarakhand and voucher specimen was deposited at the NHCP, New Delhi. During explorations undertaken in parts of Uttarakhand, the second and third authors noted its cultivation for ornamental use in the backyard (2000-3500m). It was also observed under sporadic cultivation as ornamental in the kitchen garden in Mokokchung, Mokokchung district in Nagaland by the third author.

Mature plants (4-5 months old) of fragrant false garlic produced sweet scented flowers in December-March. The bulbs were deep-seated; bulblet developed a hard brown outer membrane at maturity (Fig.1). They could overwinter and sprout in the winter season. Seed shattered when plant was fully mature and dry. Plant responded well to propagation by both, seed or bulblets. An average fragrant false garlic plant produced over 75-110 seeds/inflorescence. Seeds were observed to show 80-90 per cent germination immediately after maturity but after six months the viability was reduced to less than 20 per cent (Dr J Radhamani, ICAR-NBPGR; *pers. com.*).

The bulblets easily get dislodged from the parent bulb when plants were manually uprooted. In nature, bulblets get separated from the parent plant and move along with soil clodes (spread through irrigation or by

contaminated agricultural produce) this process enables faster spread. Perennating bulblets emerged into new plants in growing season (November-December) (Fig.1). The seedlings generally escaped manual eradication due to their gross morphology resembling the common grasses. Repeated tillage helps in reducing the weedy growth.

Fragrant false garlic is an introduced species in India with poor documentation of its occurrence under cultivation. In earlier literature (Ambasta *et al*., 1986) there was no mention about occurrence of the genus as useful plant species or as weed from India. Fragrant false garlic was noted as a new record of occurrence in Patiala district, Punjab, India (Sharma, 1985); and also under naturalised condition in waste places in Punjab (Sharma, 1994). Many earlier reports on its use as a favourite material for cytological study indicated its probable introduction for experimental purpose (Sharma and Sarkar, 1957; Tandon and Kapoor, 1981). Study of floristic records using herbarium based study at Botanical Survey of India (BSI), Dehradun and Forest Research India (FRI), Dehradun confirmed its naturalization in parts of Punjab (Bhandari Gardens, Patiala; Model Town, Patiala and Punjab University, Chandigarh). However, exact time of introduction of this species in India is unknown.

Fragrant false garlic is a hardy bulbous perennial with potential to infest barren land, waste places and the abandoned areas. Globally it is reported as weed from many parts of the world as naturalized species in common habitats like roadsides, waste places, disturbed lands, landscaped areas, gardens, etc. (George, 1994; Groves *et al*., 2005).

In view of the above and earlier reports of its tendency to naturalise, this species was subjected to weed risk assessment to understand its weedy potential. During experimental study the species was found highly adaptable to wide range of habitats from hilly areas to plains; the plants showed quick plant growth, reproduction by seed and as well as by underground bulblets and high seed germination potential.

Weed risk assessment was done based on standard questionnaire (Singh *et al.,* 2013). This database is designed to provide information, including biological and ecological, on invasiveness mentioned in an international weed list, or are legislated against in a state or territory. *Nothoscordum gracile* was subjected to weed risk assessment system based on a question-based scoring containing 49 questions about its climatic preferences, biological attributes, reproduction and dispersal methods. The response to the questions generated a numerical score with positive correlation to the weediness (Annexure 1). The system generated a score of '14' for this species and therefore assessed it as an agricultural weed which revealed its potential as serious weed in agricultural land.

Information generated in the present study may add to our knowledge on occurrence of this species from various parts of India. Besides, weed risk assessment on this species will add its naturalization potential on escape from cultivation.

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Annexure 1

Weed Risk Assessment Questionnaire

Answer yes (y) or no (n), or don't know (leave blank or ?), unless otherwise indicated

		Botanical name:	*Nothoscordum gracile*	Outcome:	Reject
		Common name:	Fragrant false garlic	Score:	14
		Family name	Alliaceae	Your name:Dr. Mool Chand Singh	
	History/Biogeography				
A	**1**	*Domestication/*	1.01	Is the species highly domesticated. If answer is 'no' go to question 2.01	n
C		*cultivation*	1.02	Has the species become naturalized where grown	y
C			1.03	Does the species have weedy races	
	2	*Climate and*	2.01	Species suited to Indian climates (0-low; 1-intermediate; 2-high)	1
		Distribution	2.02	Quality of climate match data (0-low; 1-intermediate; 2-high)	1
C			2.03	Broad climate suitability	y
C			2.04	Native or naturalized in regions with extended dry periods	n
			2.05	Does the species have a history of repeated introductions outside its natural range	y
C	**3**	*Weed*	3.01	Naturalized beyond native range	y
E		*elsewhere*	3.02	Garden/amenity/disturbance weed	y
A			3.03	Weed of agriculture/horticulture/forestry	y
E			3.04	Environmental weed	n
			3.05	Congeneric weed	
		Biology/Ecology			
A	**4**	*Undesirable*	4.01	Produces spines, thorns or burrs	n
C		*traits*	4.02	Allelopathic	n
C			4.03	Parasitic	n
A			4.04	Unpalatable to grazing animals	y
C			4.05	Toxic to animals	n
C			4.06	Host for recognised pests and pathogens	
C			4.07	Causes allergies or is otherwise toxic to humans	
E			4.08	Creates a fire hazard in natural ecosystems	n
E			4.09	Is a shade tolerant plant at some stage of its life cycle	n
E			4.10	Grows on infertile soils	n
E			4.11	Climbing or smothering growth habit	n
E			4.12	Forms dense thickets	n
E	**5**	*Plant type*	5.01	Aquatic	n
C			5.02	Grass	n
E			5.03	Nitrogen fixing woody plant	n
C			5.04	Geophyte	y
C	**6**	*Reproduction*	6.01	Evidence of substantial reproductive failure in native habitat	n
C			6.02	Produces viable seed	y
C			6.03	Hybridises naturally	
C			6.04	Self-fertilisation	n
C			6.05	Requires specialist pollinators	n
C			6.06	Reproduction by vegetative propagation	y
C			6.07	Minimum generative time (years)	1
A	**7**	*Dispersal*	7.01	Propagules likely to be dispersed unintentionally	y

C		*mechanisms*	7.02	Propagules dispersed intentionally by people	n
A			7.03	Propagules likely to disperse as a produce contaminant	y
C			7.04	Propagules adapted to wind dispersal	n
E			7.05	Propagules have dormancy	
E			7.06	Propagules bird dispersed	
C			7.07	Propagules dispersed by other animals (externally)	
C			7.08	Propagules dispersed by other animals (internally)	
C	**8**	*Persistence*	8.01	Prolific seed production	y
A		*attributes*	8.02	Evidence that a persistent propagule bank is formed (>1 yr)	
A			8.03	Well controlled by herbicides	y
C			8.04	Tolerates or benefits from mutilation, cultivation or fire	
E			8.05	Effective natural enemies present in India	
	A= agricultural, E = environmental, C= combined				

Plant Germplasm Registration Notice*

The Plant Germplasm Registration Committee of ICAR in its XXXth meeting held on September 4th, 2014 at the National Bureau of Plant Genetic Resources, New Delhi approved the registration of following 18 germplasm lines out of 108 proposals considered. The information on registered germplasm is published with the purpose to disseminate the information to respective breeders for utilization of these genetic stocks in their crop improvement programmes. Upon request, the developer(s)/author(s) is/are obliged to distribute the material for crop improvement programme of National Agricultural Research System.

1. HI-8708 (IC0611303; INGR 14042), a Wheat (*Triticum turgidum* ssp.*durum*) Germplasm with Leaf Rust Resistance

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Leaf rust caused by *Puccinia triticina* is one of the most important diseases affecting durum wheat cultivation. Many Indian durums are susceptible to several leaf rust pathotypes particularly 12-5 and 104-2 (Mishra *et al.,* 2009). Central zone (CZ) is the migratory route of leaf rust urediospores (Nagarajan and Joshi, 1985) and rust inoculum built up on any susceptible variety in CZ could be a serious threat to later sown crop in the Indian wheat bowl, North Western Plains Zone. Hence, broadening of genetic base for resistance by developing the varieties with different leaf rust resistance genes is one of the most important strategies for leaf rust management. Hence, a leaf rust resistant durum wheat genetic stock was developed at Indian Agricultural Research Institute, Regional Station, Indore, MP by crossing agronomically superior and popular durum variety, HI 8498 with an advanced line HG 822 (both were developed at Indore station).

Durum wheat genotype, HI 8708 (HG 822/ HI 8498), was identified as resistant to leaf rust in multi-location testing *viz.,* Plant Pathological Screening Nursery (PPSN), Elite PPSN and Multiple Disease Screening Nursery (MDSN) from 2009 to 2012. It showed high levels of adult-plant resistance to most prevalent and virulent leaf rust pathotypes 77-5 and 104-2 of leaf rust (Table 1). It showed both seedling and adult plant resistance to all the leaf rust pathotypes tested (Table 2). It may be noted that most of the known examples of durable rust resistance in wheat are of adult-plant type.

Hence, this genotype can be used as potential resistance donor to breed varieties against prevalent and most virulent leaf rust pathotypes.

Table 1. Field responses of HI 8708 to wheat Leaf rust

Year of testing	Trial	Mixed pathotypes				APR to specific pathotypes	
		South		North		77-5	104-2
		HS	ACI	HS	ACI	Delhi	Delhi
2008–09	NIVT 5B	10S	2.1	TR	0.0	-	-
2009–10	AVT I	10MS	2.1	TMS	0.2	TR	10R
2010–11	EPPSN	TR	0.1	TMR	0.1	-	-
2011–12	MDSN	TR	0.1	TR	0.0	-	-

Source: AICW&BIP – Crop Protection report (2009-12)

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