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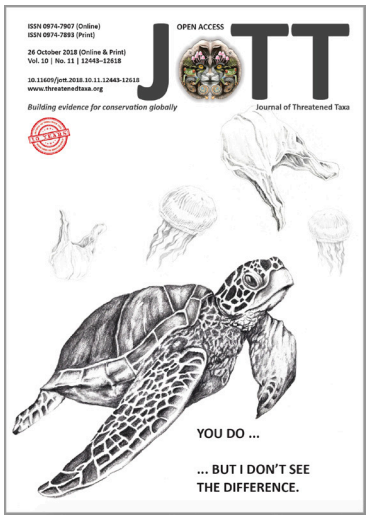

Note

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Cultivation of the Himalayan seasoning *Allium* in a remote village of Uttarakhand, India

Chandra Prakash Kuniyal [1] & **Bir Singh Negi** [2]

[1] Herbal Research and Development Institute, Mandal, Gopeshwar, Chamoli, Uttarakhand 246401, India
[2] Department of Agriculture, Cooperation and Farmers Welfare, Government of India, Krishi Bhavan, New Delhi 110001, India
Present address: Consultant to the National Horticulture Board and NABARD, Government of India, 302, Best Avenue Apartment, Balbir Road, Dehradun, Uttarakhand 248006, India
[1] cpkuniyal@rediffmail.com (corresponding author), [2] negi.bir59@gmail.com

Himalayan Seasoning Allium or Strachey's Chive *Allium stracheyi* Baker (Family: Amaryllidaceae; vernacular: 'Faran', 'Jambu'), growing between 2000–4000 m in the western Himalaya, is a bulbous perennial herb that is commonly used as a spice and culinary herb. The pleasant aroma of Chives is favoured for flavouring and seasoning food items (Anonymous 2003), and this species is also useful in promoting digestion and in relieving cold and cough (Maikhuri et al. 2017). *Allium stracheyi* is enlisted as Vulnerable in the Red Data Book of Indian Plants (Dasgupta 1990). Ved et al. (2003) have also categorized it as Vulnerable in the western Himalayan states of Jammu & Kashmir, Himachal Pradesh, and Uttarakhand. Regional field information on its distribution and use categorized *A. stracheyi* under cultivation and low-pressure medicinal and aromatic plants in the Uttarakhand (Rawat 2005). In some parts of Uttarakhand, *A. auriculatum* Kunth is in cultivation and may be misidentified as *A. stracheyi* (Rawat 2005). Some authors have also mentioned 'Pharan' as *A. carolinianum* Redoute (Silori & Badola 2000). In some other reports, the vernacular for *A. stracheyi* is mentioned as Jambu (Negi 2012); however, the variation in local names may be due to different dialects. The foliage of *A. stracheyi* contains a higher quantity of carbohydrate, protein, vitamin C, vitamin E, and phosphorus as compared to its allied species such as *A. humile* Kunth and *A. rubellum* M. Beib. (Maikhuri et al. 2017).

The Himalayan Seasoning Allium is cultivated in several cold desert villages located in the buffer zone of the Nanda Devi Biosphere Reserve (NDBR) in districts Pithoragarh and Chamoli in Uttarakhand, India. Tolma (~2600–2800 m; 30.524^{0}N & 79.752^{0}E), a small, remote village located between the cold desert and a temperate region of NDBR in Chamoli District, western Himalaya, however, is well-known for traditional cultivation of this species for generations (Fig. 1, Image 1). According to natives, cultivation of *A. stracheyi* in Tolma may have begun in 1915–1920 as an innovative trial and the area under cultivation was not more than a common kitchen garden having an expansion of few metres. Some reports, however, state that prior to the closure of Indo-Tibet trans-border trade during the early sixties, *A.*

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stracheyi was exchanged with India by the Tibetan Lamas or other traders for bartering of daily need commodities, and possibly after 1960s, commercial cultivation of *A. stracheyi* was started in this region (Nautiyal & Nautiyal 2004). It is important to note that the cultivation of *A. stracheyi* is also acting as an anticipated measure for the conservation of its genetic resources (Pandey et al. 2008). Cultivation of *A. stracheyi* in Tolma Village is an interesting practice; therefore, the survey was conducted in 2015 for finding the cultivation status and economic benefits of *A. stracheyi*.

At present, a total of 20 out of 25 families in Tolma Village are cultivating *A. stracheyi* in a total of 1.10ha area. Of them, 17 have an average of 0.03ha area (0.02–0.06 ha) and three have an average of 0.18ha area (0.14–0.22 ha) under *A. stracheyi* cultivation. Being perennial, *A. stracheyi* is harvested twice a year (in June and September) and about 35.00kg dried leaf (foliage) is obtained from 0.02ha (equal to 1 'nali', 1 nali = 10 x 20 m area, 50 nali = 1ha; nali-vernacular) is a common parameter used for measurement of land) in a year. At the village level, during 2015–16, the prices (per kg) for Faran were close to about INR 350.00 (USD 5.44; INR 64.29 = USD 01, as on 19 September 2017). Therefore, the gross income of farmers having a minimum of 0.02ha area under cultivation was approximately INR 12,250.00 per year (USD 190.54) and those having a maximum of 0.22ha area under cultivation was approximately INR 134,750.00 per year (USD 2,095.97). Therefore, the estimated gross income from the cultivation of *A. stracheyi* in a hectare was INR 612,500.00 (USD 9,527.14). The gross income from cultivation of *A. stracheyi* in 0.02ha area was INR 8,750.00 in 2011. The price/kg for Faran at village level then was INR 250.00 while the estimated gross income from the cultivation of Potato *Solanum tuberosum* from 0.02ha was merely around INR 1,600.00 (Kuniyal & Sundriyal 2013). Therefore, cultivation of *A. stracheyi* is economically profitable than that of traditional crops. Marketing of this species, both at the local level and outside, is quite comfortable and in local fairs, approximately 10.00g Chive may be sold at INR 20–25. Sometimes, the expected produce in this village is booked by traders in advance; therefore, the tradition of cultivation and effortless trade of *A. stracheyi* is remarkable. The produce when dried, can be stored easily for a few months. Being a light and dried plant material, the transportation of the produce is easy and does not require special means.

Total cultivation cost in an established field (excluding the cost of planting material, as once this species is planted, it will flourish for many years; nearly 1.8 to 2.7 lakh plants may be required in a hectare) (Nautiyal & Nautiyal 2004), including the cost of farmyard manure, weeding, harvesting, and processing for *A. stracheyi*

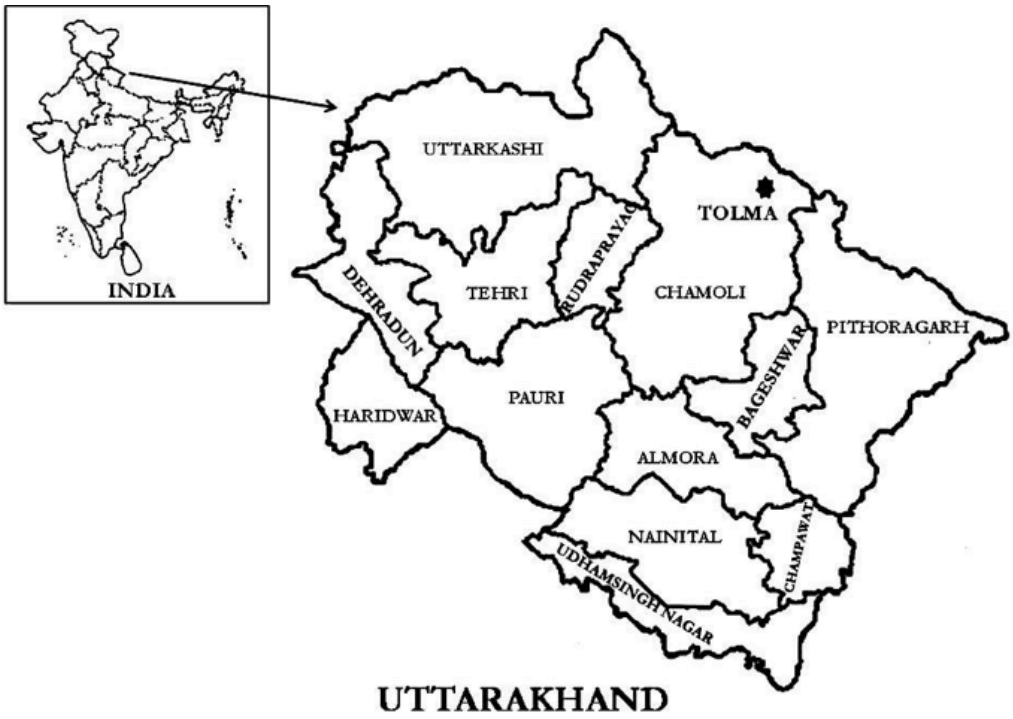

Figure 1. Map of Uttarakhand showing the location of Tolma Village in Chamoli District (not to scale)

Image 1. Cultivation of *Allium stracheyi* in Tolma Village, Chamoli District, Uttarakhand

is around INR 140,000.00/ha/annum and the net profit is likely to be INR 472,500.00/ha/annum. After processing (chopping and preferably shade drying), average production per ha of *A. stracheyi* is estimated to be around 1,750.00kg (1.75 metric ton (MT); 1MT = 1,000.00kg). In some other mountain valleys located in the vicinity of NDBR, however, the production of *A. carolinianum* (Pharan — the species used similarly as *A. stracheyi*) and *A. wallichii* Kunth (Jambu) are reported to be 79.3 kg/ha/year and 102.8 kg/ha/year (Silori and Badola 2000) and around 2,431.00kg *A. stracheyi* (Jambu) from 3.45ha area (Negi 2012).

The cultivation of Himalayan Seasoning Allium in other villages such as Malari, Jhelum, Gamshali and Niti in Chamoli District and Martoli, Pachhu and Milam in Pithoragarh District in Uttarakhand is either sparse or not practiced by the majority of the families inhabiting the village, and harvesting from the wild is also common (Bhatt 1999). Since agro-climatic conditions vary in mountains areas, the information on production may vary. The villagers of Tolma, however, have been cultivating this species for generations and, therefore, their information on productivity may be considered as more reliable. Cultivation of *A. stracheyi* in Tolma Village is an excellent example of a traditional practice being upheld as a customary one, as well as being established as a profitable business. It was also interesting to note that out of the 20 families cultivating *A. stracheyi* in this village, only one has received any kind of financial support from government agencies for extension activities. Therefore, this is an exemplary practice for a MAP cultivation that is flourishing without any subsidy or support price. In addition to attractive economic benefits, *A. stracheyi* has its importance as a domestic culinary herb and indispensable gift. This village is also a source of planting material of this species for surrounding areas and nearby villages. On the other hand, cultivation of *Picrorhiza kurrooa* and *Saussurea costus* are some of the other examples of medicinal plant cultivation in Uttarakhand; however, in order to maintain the cultivation of these two species, intensive and extensive attempts were initiated at the policy, legal, and facilitation levels (Kuniyal et al. 2015; Kuniyal & Negi 2016).

The cultivation of *A. stracheyi* in this village is an excellent conservation practice. Also, some of the produce grown by villagers is stored for 4–6 months for domestic use during winter season. The post-harvest practices for *A. stracheyi*, however, are still traditional and the area under cultivation is nearly consistent from many years. Sometimes, the material chopped and dried traditionally also gets infected by diverse types of fungal/ bacterial infections. Therefore, for financial attractiveness, advancement in technology is essential (Buschke 2015). It is suggested that the traditional method of chopping and drying must be replaced with

new and less destructive methods. Studies are required to standardize suitable moisture content in dried materials. Better post-harvest processing, attractive packaging, and organic branding will also help the farmers in terms of increased economic returns as compared to their current income. In the advent of more attractive and new food crops like Pea (*Pisum sativum*), challenges may occur for maintaining this practice. Attempts for establishing exact scientific identity of similarly used cultivated Allium in Uttarakhand and their area expansion are also suggested. Microclimatic conditions for cultivation of *A. stracheyi* in this village are suitable and the flavour of Tolma's Faran is much favoured; therefore, this village may also act as an excellent research site for initiating the work on development of improved varieties.

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