Figure 2. Freshly harvested tomato.

technology for easy multiplication and regeneration of chironji, and to popularize its importance among local inhabitants/tribals.

Due to seasonal drought in kharif for the last 7–8 years, the farmers of Sonbhadra District have not been able to harvest paddy crop. More than 60% of the farmers depend on paddy. However, erratic, uncertain rainfall and seasonal drought has resulted in poor production of the crop. Due to this and in response to the efforts of the Krishi Vigyan Kendra (KVK) and results of on-farm trails and front line demonstrations conducted by KVK, the farmers have shifted towards tomato cultivation (it was already known that tomato can be cultivated as off-season rainfed crop during kharif under upland condition). In the beginning the local cultivar named *Kajala* was popular, then Sel-7, Sel-22, DVRT-1, DVRT-2, H-86 and JK desi were popularized. In recent years hybrid varieties like 3585 of Sungrow, 2535 of Namdhari, US-404 of Agriseeds, NP-5005 (Lakshmi) of Nunhems Pro Agro are dominating and yield between 350 and 550 q/ha. At present, more than 12% of the area under paddy cultivation is converted into tomato cultivation. Robertsganj mandi has been established as a big and stable market for the merchants from far-off destinations.

The unique characteristic of this tomato crop is that without any irrigation facilities under upland condition, in sloppy, undulated and hilly tracts under low-land condition, in black cotton and red laterite soils, it is growing well and farmers are getting good returns (Figure 2). On the basis of economics we have observed that after spending Rs 50,000–60,000/ha, one is benefitted with a net return of around Rs 100,000–150,000/ha in a single cropping season. This indicates that the tribals of Sonbhadra district are marching towards self-sustenance with cultivation of off-season tomato. There will be more economic and sustainable growth if proper attention is paid to the conservation of forest resources as a whole and chironji in particular.

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Tricotyledony in *Hippophae rhamnoides* L. (Elaeagnaceae)

The phenomenon of typically dicotyledonous plants producing three cotyledons has been referred to as tricotyledony or tricotyly. More generally, the production of an abnormal number of cotyledons has been referred to as pleiocotyly. Molecular studies have shown that a few mutated genes could produce tricotyledonous traits in the model plant, *Arabidopsis*[1,2]. Tricotyledonous seedlings occur sporadically in nurseries of dicotyledonous plant species in over 15 families of plants[3]. However, the phenomenon has not been reported in seabuckthorn (Elaeagnaceae).

The actinorhizal plant seabuckthorn (*Hippophae rhamnoides* L., Elaeagnaceae) is dioecious and wind pollinated. Seabuckthorn berries are among the most nutritious of all fruits and have immense medicinal properties. Seabuckthorn is mentioned in the writings of ancient Greek scholars such as Theophrastus and Dioscorides. The medicinal value of seabuckthorn was recorded as early as the 8th century in the Tibetan medicinal classic *rGyud Bzi* (Four Text of Fundamental Tibetan Medicine). The shrub serves as a storehouse for researchers in the field of biotechnology, neutraceutical, pharmaceutical, cosmetic and environmental sciences[4].

During our study in 2009 to check seed viability of a 10-year-old seabuckthorn seed stock, we observed few seedlings with three cotyledon leaves. To check the frequency of tricotyledony in seabuckthorn, seeds from 30 different plants maintained in field gene bank (lat. 34°08.2′N, long. 77°34.3′E, altitude 3340 m amsl) at the Defence Institute of High Altitude Research, Leh-Ladakh were collected in 2010. Seedlings were raised in pots and emergence of cotyledon number was checked on each plant approximately every 3 days. Plants were scored in three categories: two full cotyledons, three full cotyledons and greater than three cotyledons. Tricotyledonous seedlings were transplanted into the greenhouse.

The observed tricotyledon frequencies among the 2798 germinated seedlings from 30 plants ranged from 0% to 6.4%, with an average of 0.64%. A rare single tetracotyledon seedling was also observed. Low frequency of tricotyledony has also been reported in *Brassica oleracea* var. *capitata* (0.6%)[5], *Crotolaria juncia*

Figure 1. Seabuckthorn seedling with three cotyledons and three true leaves.

(1.05%)[6] and *Raphanus raphanistrum* (0.53%)[3].

None of the cotyledonary leaves showed any sign of external distortion or splitting and were arranged symmetrically in a whorl. Seedlings bearing three cotyledons also bear three true leaves at each internode of the first few internodes (Figure 1). Plants with three cotyledons are potentially useful for faster establishment of seedlings after planting because of the larger leaf area in the early growing stages and may serve as a morphological characteristics for distinguishing cultivars[7].

Limited number of seedlings are available at the Defence Institute of High Altitude Research, Leh-Ladakh for five years. Recipients of cuttings have been asked to make appropriate recognition of the source of the germplasm if it is used in research studies, development of a new cultivar, germplasm, parental line or hybrid.

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Has *Dracunculus* really been eradicated?

Dracunculus medinensis (guinea worm), a nematode endoparasite, has been known since biblical times and had been endemic in India, Pakistan, West and Central Africa, and the Middle East[1]. Rajasthan was severely affected by dracunculiasis, especially southern Rajasthan (Dungarpur, Banswara and Udaipur districts) and was hyperendemic about two decades ago[2,3]. The alarming status of the guinea worm led to the launching of the SWACH project by the government in 1986. This project assured proper sanitation and supply of clean and hygienic potable water to the residents of *Dracunculus* endemic areas and, as expected, it was a huge success. Owing to the success of the SWACH project, a decade later the State Government declared Rajasthan rid off *Dracunculus*[4]. But, as we know every species struggles for its existence and so did *Dracunculus*. Not much later, i.e. in 2002 and 2003 two cases of dracontiasis were reported from Dungarpur and Banswara disrtricts[5,6]. Choubisa[7] reported the third case of guinea worm in a 40-yr-old tribal subject from Rajasthan (Figure 1). Recently, two more instances from the villages of Rajasthan were reported in the press[8].

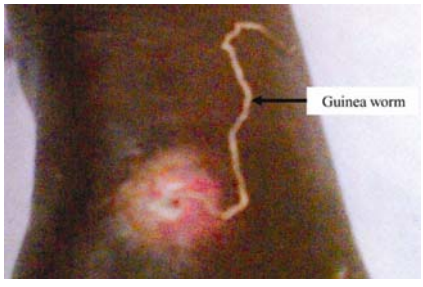

Figure 1. Guinea worm from a shallow ulcer in the foot of a 40-yr-old man (source: Choubisa)[7].

The recurrence of *Dracunculus* in a so called '*Dracunculus*-free state' is questionable. In its strive for existence, *Dracunculus* has possibly found some new reservoir or intermediate host like monkeys and dogs that share their habitat with humans, and may spread the infection by contaminating the drinking water sources that are generally open, or step wells in the villages[9–11]. Another probability can be migration of these residents to other adjoining endemic states as Gujarat and Madhya Pradesh for earning their livelihood and in turn getting the infection. *Dracunculus* appears to have succeeded in maintaining its gene pool despite of so many efforts of the humans to eradicate it or rather cause its extinction.

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