suggested that andromonoecy is controlled by a single gene and is recessive to monoecy in ridge gourd. Similar inheritance pattern has been reported for these sex forms in bottle gourd by Singh *et al.*[8]. Thakur[9] reported that both in intervarietal crosses of *L. acutangula* and in interspecific crosses between *L. acutangula* and *L. cylindrica*, sex form was found to be digenically inherited. Based on the assumption that the basic sex in angiosperms is hermaphrodite, it was postulated that sex expression in *Luffa* is controlled by two independent suppressor genes, *A* and *G*, the former suppressing the male organ in the solitary flowers and the latter suppressing the femaleness of the racemes[9]. When both these dominant suppressing genes were present, the plant showed monoecism. In the presence of *G* and recessive gene '*a*', the plant becomes andromonoecious. Based on this, AM-43 sex form can be genetically represented as 'aaGG'.

Ridge gourd is a cross-pollinated crop because of its monoecious flowering habit and pollination is effected by honey bees. Successful cultivation of ridge gourd in rainy season is limited by high incidence of downy mildew disease, and poor fruit set due to pollen washing out. However, better fruit set is possible in plants exhibiting andromonoecy, due to presence of hermaphrodite flowers, as they have the ability to set fruits following self/cross pollination. Further growing such plants in polyhouses during rainy season, should help protect crops from downy mildew as well as excess rains. But andromonoecious lines produce small fruits. Hence, to make commercial cultivation of andromonoecious lines feasible, AM-43 will be useful in introgressing its andromonoecious gene into the long fruited monoecious lines to develop andromonoecious varieties with increased fruit length and more number of fruits. The high yield potential andromonoecious ridge gourd varieties thus developed, should be suitable either for polyhouse cultivation or for rainy season cultivation in open conditions.

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Feasibility of quinoa cultivation in Ladakh

Situated at an altitude of about 3000 m amsl, Ladakh, J&K, India is known for its extremely harsh climate for crop growth. Extremely low temperatures, extreme aridity, large diurnal variation and uncertain weather changes are characteristic features of the climate in Ladakh. These coupled with agriculturally marginalized land which is poor in its physical, chemical and biological properties have resulted in an inherently poor agriculture production system. Only a handful of field crops like barley and to some extent wheat, mustard and pulse pea which can mature within 120–150 days of the cropping window available during May–September are grown traditionally. Productivity of these crops remains low due to poor supply of input owing mainly to physical isolation from the mainland and poor economic condition of the peasants. Any alternative field crop that has the potential to produce better yield than these traditional crops, that too with limited input, is worth experimenting in order to give an option to farmers in the region. One such crop, which also has promising world market, is quinoa.

Quinoa (*Chenopodium quinoa*) – a plant of South American origin – is in demand worldwide due to its high nutritional value and its ability to grow in extremely poor conditions. It is a pseudo cereal whose grains can be used as a substitute for cereals (carbohydrate 71%; calories 350 per 100 g)[1]. Besides providing energy, its grain is rich in protein (13.81%–21.9%) of high quality. In fact quinoa grain is the only food of plant origin that provides all essential amino acids for human nutrition standards established by FAO[1]. What is more, the essential amino acids that are present in quinoa are located in the nucleus of the grain, not in the exosperm or hull as in case of rice or wheat, and thus remain preserved in the grain even after processing. Furthermore, due to its high total dietary fibre (TDF 6% of the total weight of the grains), quinoa intake promotes intestinal transit, eliminates toxins and waste products that can damage the body and regulates cholesterol. Quinoa also helps reduce LDL (or bad cholesterol) in the body and increase HDL (good cholesterol) due to its omega 3 and omega 6 fatty acid content[1].

The crop has remarkable adaptability to different agro-ecological regions. It

Figure 1. ***a***, Appearance of inflorescence in quinoa at Leh (20 September 2015). ***b***, Changed colour of inflorescence indicating crop maturity (7 October 2015). ***c***, Grains of quinoa harvested at Leh (13 October 2015).

Table 1. Preliminary findings of quinoa cultivation in Ladakh

Date of sowing	17 June 2015
Date of harvesting	13 October 2015
Days to maturity	119
Seed rate	10 g/3 m^2 (33 kg/ha)
Spacing	20 cm × 10 cm
Days to germination	9
Average plant height	1.28 m
Maximum plant height	1.58 m
Seed yield	200 g/3 m^2 (667 kg/ha)

can withstand temperatures from –4°C to 38°C. It is a light-insensitive and highly water efficient plant, tolerant and resistant to lack of soil moisture, and produces acceptable yields with rainfall of 100–200 mm (ref. 1). The capacity of this plant to grow in saline areas of low fertility allows its establishment in areas unsuitable for other crops. Another abiotic factor that quinoa tolerates is frost before flowering, an outstanding feature for cold regions. Additionally, given the hardiness of the crop, the risk of losses due to adverse conditions is significantly lower compared to other crops[2].

The high-quality proteins present in its seeds are little affected by the cultivation conditions, particularly in water-deficit situations. This makes the plant resilient, a useful quality where agriculture faces problems of aridity, degraded or saline soils. The 20 amino acids often maintain their proportions in different cultivation conditions, with little impact on the quality of their proteins[3].

In 1996, quinoa was classified by FAO as one of humanity's most promising crops. In 2009, it was declared as a potential crop of the future by FAO. The UN named 2013 as the 'International Quinoa Year'. NASA also included it within CELSS (Controlled Ecological Life Support System) to equip its rockets in long-duration space travel[1].

Due to rising demand of quinoa worldwide, concerted efforts have begun since 1990s and 2000s to systematically introduce and cultivate this crop outside its traditional distribution zone in South America. It is one of the fastest-growing commodities in world trade in recent years. Export sales have increased 39 times between 2002 and 2012.

Quinoa was introduced into India from Peru[4]. It is reported to have been in cultivation in some of the North East regions of India[5]. However, systematic trials started in India at National Botanical Research Institute, Lucknow around 1990–2000s[6]. Recently, quinoa has been successfully cultivated on a large scale in drought prone Anantapur district, Andhra Pradesh under 'Project Ananta'[7] and in Mysore, Karnataka[8].

Keeping in view the above facts, especially agricultural production conditions of Ladakh characterized by low humidity, extremely cold climate and reduced availability of inputs, and the prospect of quinoa cultivation in such conditions, a preliminary trial was conducted at the Stakna Farm of High Mountain Arid Agriculture Research Institute, SKUAST-K, Leh to test the suitability of quinoa cultivation in Ladakh. The site is located at an altitude of 3319 m amsl with lat. 33°58.551′NS and long. 77°41.995′EW, and at a distance of 27 km southeast of Leh along the Leh–Manali Highway. An experimental plot of 1.5 m × 2.0 m size was selected to sow 10 g of quinoa seeds (var. Raksha Srinova) received from DRDO, New Delhi. The seeds were sown in 10 lines and 20 cm apart. Germination started after 9 days of sowing. The seedlings were thinned one month after germination to maintain a plant-to-plant distance of 10 cm. No fertilizer, insecticides or pesticide was applied.

Table 1 shows the preliminary data recorded in the present study. On the basis of crop growth and its performance (Figure 1), it can be summarized that the crop performed well and the grain yield was 20 times more than that sown. In Ladakh, its performance is better than all other grain crops like wheat and barley, which yield at the most 7–8 times the weight of the seed sown. Another important feature of the crop is the high production of plant biomass, which could be utilized as nutritive feed in the fodder-deficit region. Cultivation of quinoa seems promising in the cold arid region of Ladakh. Extensive studies need to be conducted to popularize the crop in Ladakh.

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New orchids record in the flora of China

China is an orchid-rich country with 194 genera and 1388 species recorded, mainly in the tropical and subtropical regions of the south and southwest[1]. Many new species are still being found and reported[2–7]. In 2012–14, during a study in southwest China, three more species were collected and are being reported here.

1. *Dendrobium vexabile* Rchb. f. in *Gard. Chron.*, 1:271. 1884; Kraenzlin in Engler, Pflanzenr. 45:309.1910.

Chinese name: 反唇石斛 (Figure 1)

Plant epiphytic, pendent, 30–60 cm long. Stems slender, branching from nodes, internodes covered by sheaths, yellowish, 1.8–4.8 cm long. Leaves lanceolate, acute to acuminate, entire, sessile, distichous, 5–7.2 × 1.4–1.9 cm. Inflorescence leaf-opposed, 1–2 flowered; peduncle short, sheathed at base, 0.9–1.3 cm long; sheaths membranous, overlapping, 4–5 mm long; flora bracts broadly lanceolate, three-veined membranous, 4–5 × 2.5–3.5 mm. Flower fragrant, 2 cm across, pale primrose-yellow to cream, lip with numerous radiating streaks of brown–purple and yellow, disc on lip green; pedicle and ovary slender, 0.6–1 cm long. Sepals sub-similar, seven-veined, 1.1–2.2 × 0.5–0.8 cm; dorsal sepal elliptic, obtuse; lateral sepals broadly elliptic, weakly falcate, widening towards base; mentum broad, with a short bifid pouch, 3–4 mm long. Petals oblong, subspathulate, obtuse, 0.9–1.1 × 0.3 cm. Lip three-lobed, deeply concave to hooded, obovate to rhombic (when spread), 1.3–1.6 × 1.2–1.8 cm; lateral lobes large, broad, convolute; mid-lobe suborbicular, bifid, deflexed, margins crisped; disc with an elongate, villous crest, extending from base to near apex. Column with foot, 8–9 mm.

Flowering: February to May
Distribution: India, Myanmar, Bhutan and China (Tibet: Linzhi, Motuo).
Habitat: Tropical monsoon forest, epiphytic on the tree along the Yalung Zangbo River, about 800 m.
Specimens examined: China: Tibet province, Linzhi district, Motuo county, 14. Sep. 2014, *Q. Liu 205* (HITBC); India: Sikkim Himalaya, *R. Pantling 117* (P).

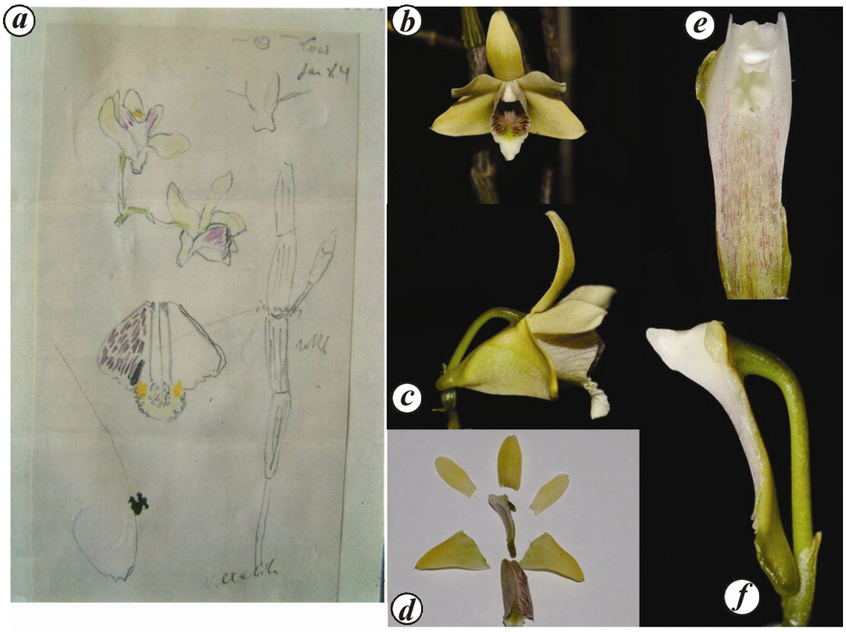

Figure 1. *Dendrobium vexabile* Rchb. f. ***a***, Illustration of type specimen from herbarium of Naturhistorisches Museum Wien (W) B. ***b***, Front view of flower; ***c***, Lateral view of flower; ***d***, Parts of flower; ***e***, Front view of column and ***f***, Lateral view of column.