



Mini review

## Pepino (*Solanum muricatum* Ait.): A potential future crop for subtropics

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**Abstract:** Pepino (*Solanum muricatum*) is an Andean region's crop, originated from South America. The crop has medicinal values and underutilized for its cultivation. It has a wider adaptability across the different locations of Spain, New Zealand, Turkey, Israel, USA, Japan *etc.* The crop can be grown under diverse soil and climatic conditions in India also. Its fruits are juicy, mild-sweet, sub-acidic and aromatic berry which are rich in antiglycative, antioxidant, dietary fibres and low calorific energy. Fruit is visually attractive with golden yellow colour with purple stripes. The crop was evaluated for its growth and development at ICAR-Central Institute for Subtropical Horticulture, Rehmankhera, Lucknow, Uttar Pradesh, India (planted in the month of October, 2014). The results of the study exhibited its adaptation to climatic conditions of subtropics with higher yield and acceptable fruit quality.

**Keywords:** *Solanum muricatum* - Pepino - Subtropic - Adaptation.

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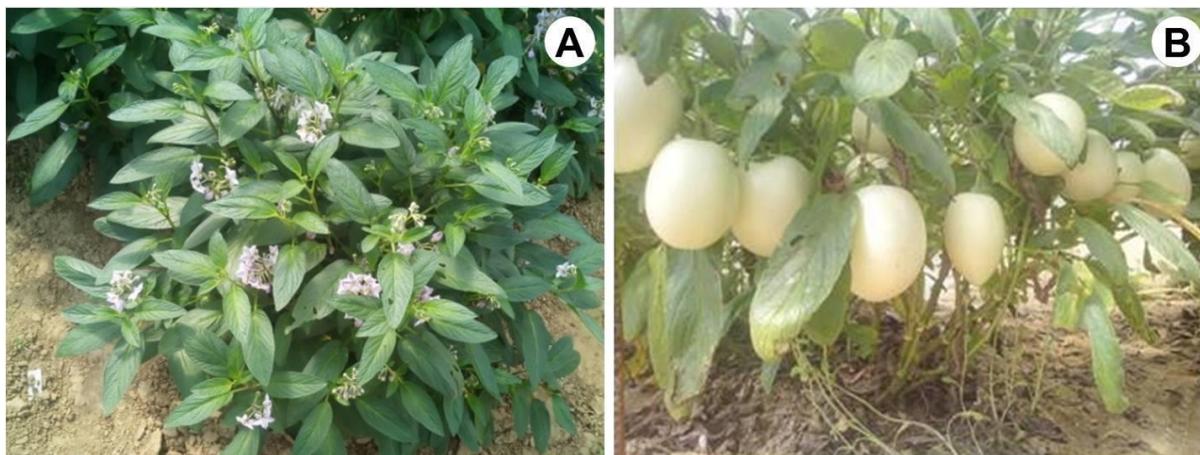
### INTRODUCTION

Introduced crops have a vital role in the progress of mankind; on any region of the world, many most important crops did not originate there but were new crops at the time of their introduction. Nonetheless, many underutilized or neglected crops and nondomesticated species that could develop as new crops in many regions worldwide are to be explored. The diversification and introduction of these new crops are growing interest as they can result in an increase of income for farmers. It can contribute to a more environment-friendly horticulture, minimize the risk of crop failure and increase ethnobotanical knowledge. For a successful establishment, a new crop must adapt to the new agro-ecological and production conditions, as well as to the demands of the markets and consumers. Introduction and adaptation of new crops have historically been one of the greatest technological challenges in agriculture, as it transfers cultivated species from their places of origin to new environmental conditions. The success in the introduction of new crops has contributed to the spread and success of agriculture and to the production of an ample and wide diversity of plant products. Most of the cultivated crops in a given region of the World were not domesticated there and once were new crops like wheat, potato and tomato in India. Unlike in former centuries, in which exploration of new areas of the world allowed the discovery and exchange of potential new crops, nowadays attempts of introducing new crops to exotic regions is mainly based on already existing, mostly neglected, crops. In this respect, there are many "lost" crops, which in some cases have the local importance that could be of interest for introduction in other areas of the world.

### About the Crop

One of the crops of Solanaceae family is Pepino (*Solanum muricatum* Aiton), which is a neglected crop that was very important in the Andean region during pre-Columbian times. It flowers between the months of December to May (Fig. 1A). The Pepino is an herbaceous crop which yields fleshy berries which weigh between 100 and 700 g, and are round, ovate or elongated, with a normally golden yellow skin (Fig. 1B). The flesh is yellow, juicy and has a sub-acid, mild flavor (Levy *et al.* 2006). It is visually attractive; the skin is commonly

golden yellow and is covered with purple stripes (IPGRI & COMAV 2004). Aroma of the fruit resembles with muskmelon. The Pepino is entirely edible, including skin and seeds and hence tastes like a cross between a pear and banana. Although, it is sexually fertile and highly heterozygous by seed propagation, but can also propagate vegetatively (normally by cuttings). Though the crop originated in South America, it has domesticated in other parts of the world like Netherland, New Zealand and Spain (Blanca *et al.* 2007).



**Figure 1.** Pepino (*Solanum muricatum* Aiton) under Lucknow conditions: **A**, Flowering; **B**, Fruiting.

### Exotic but can be grown under Indian climatic conditions

*Solanum muricatum* is of temperate, mountain and coastal climates but can be grown under tropical climates also. In the Andean region, cultivation takes place in the inter-Andean valleys and on the western slopes from 900 to approximately 2800 m amsl. These boundaries are set within the lower limit (18°C) and the upper limit 24°C at, with an annual precipitation of between 500 and 800 mm. The climatic characteristics described correspond to the high part of the subtropical dry forest and the low dry mountain forest or to the high yungas and quechua of Peru. Coastal cultivation takes place south of lat. S 7°. During the autumn and winter when the temperature fluctuates between 21–17°C and atmospheric humidity increases as a result of mists and drizzle. The original cultivation of *S. muricatum* extended along the Andes, from southern Colombia to Bolivia and the Peruvian coast.

### Fruit of medicinal importance

It's also prized for its medicinal applications. Aqueous extract of its fruit could attenuate the progression of diabetes due to its anti-inflammatory, antiglycative and antioxidant effects (Hsu *et al.* 2011). A medium serving (~100 g) of its fruit provides 80 calories of energy and 5 g of dietary fibres similar to oatmeal, which helps to lower cholesterol and it's easy to digest. The fibre also helps with constipation and it tends to sooth away gastric ulcers too. The fruit is rich in minerals and vitamin C but low in starch, sugars and free from oxalates. The minerals contained in Pepino fruits are Fe, Zn, Cu, Mn, Ca & P. It has been observed that level of glucose and fructose decreases during ripening, whereas, sucrose concentration increases as the ripening progresses. A discernible reduction has also been noticed in contents of protein and fat as the fruit turns from raw to mature (Huyskens-Keil *et al.* 1999). Pepino is known as a source of beta-carotene, 27 mg per 100 grams of fruit flesh. The crop is also considered as a sucrose accumulator during final ripening stage. Fruits picked when immature are flavorless and non-aromatic.

### Soil and climatic requirement

The crop can be grown in different types of soil, preferably low in fertility as higher fertility may hamper reproductive growth. It performs better in soil pH 6.0–7.5 with well-drained soil. Pepino has also wider soil adaptability even under salinity conditions of 8 dS m<sup>-1</sup>. A vast area in India having salt-affected soils including the coastal area where the scope for cultivation may be explored. The crop has wider adaptability across temperate, tropics and subtropical conditions but the fruit set is very much influenced by temperature, the optimum range being reported between 12–25 °C. The crop is often considered as non-climacteric fruit but some cultivars also behave as climacteric. The crop generally prefers warmth climatic conditions however if cut back even at a suboptimal temperature (< -3°C), it can survive (Prohens *et al.* 1996). The analysis of the weather

parameters during its growth and development periods (2014–15 and 2015–16) were recorded at the established agro-meteorological observatory. Monthly average minimum and maximum temperatures varied between 6.2–25.8 °C and 17.2–39.8 °C, respectively. The monthly average relative humidity ranged between 25.1–89.7 %. Most importantly higher pan evaporation up to 11.4 mm per day during summer months was recorded while in winter months as low as 2.3 mm per day was observed. Uneven distribution of rainfall was noticed. A sum of 732.2 and 553.2 mm of rainfall was recorded during 2014–15 and 2015–16 respectively. This rainfall is lower than the average of around 800–1000 mm. Unseasonal rainfall of 87.2 mm was also recorded during Jan.–Feb. months of the 2015–16 season. A bright sunshine 2.8–9.8 hour and wind velocity of 1.1–4.3 km.h<sup>-1</sup> was observed. Profuse growth and higher productivity of Pepino under such variations in weather parameters under subtropical climatic conditions of Lucknow region were observed.

### Potential in subtropics

Keeping in view the potentiality of the crop that might undergo adaptability in a subtropical environment, Pepino cuttings were planted at ICAR-Central Institute for Subtropical Horticulture, Rehmankhera, Lucknow, Uttar Pradesh, India during winter months (October, 2014). The plant survived during harsh summer conditions of 2015 (Fig. 2). The survived plants were multiplied and planted in the field conditions for performance evaluation. Fruit harvest started from March onwards and continued until the month of May. The variations in different parameters *viz.*, fruits weight (150–350 g), yield (4–5 kg per plant), moisture content (93.6%), Vitamin C (37.17 mg per 100 g), Acidity (0.13–0.14 %) and TSS (4.9–5.5 %) was recorded (Kumar 2016).



**Figure 2.** Crop growth and adaptation under subtropics (ICAR-CISH, Lucknow, India).



**Figure 3.** Profuse rooting of cutting.

**How to multiply**

The Pepino can be grown from seeds but is usually propagated vegetatively to maintain the original quality from semi-hardwood cuttings. In the subtropical conditions, the mother plants need attention during rainfall *i.e.* covering of the mother plants with ventilated plastic rain shelter from July–September. The cuttings should be made during the month of October for maximum survival in the subtropics (Fig. 3). Cuttings are easy to root and treatment with growth regulator is not mandatory.

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