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Original Article

NICANDRA PHYSALOIDES (L.) GAERTN–A LESS KNOWN WILD EDIBLE FRUIT

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ABSTRACT

Objective: Present study aims to understand the nutritional as well as medicinal potential of ***Nicandra physaloides*** fruits.

Methods: Fresh as well as shade dried material was used for estimation of moisture content, crude protein, crude fibres, lipids, fat, reducing and non-reducing sugars, total soluble sugars, starch, total nitrogen, vitamins and antioxidants. Mineral content was estimated in terms of ash yield and further analysis was carried out for qualitative and quantitative estimation of different elements. Material was also screened for presence of bioactive molecules.

Results: The study showed that, *N. physaloides* fruits were rich in proteins, carotenoids, vitamin–A and vitamin–C. The fruits were also found to be the good source of antioxidants like lycopene, anthocyanin, chlorophyll and phenols. Screening of bioactive molecules showed the presence of alkaloids, steroids, tannins, and polyoses which impart medicinal potential to plant.

Conclusion: The study confirmed the nutritional as well as medicinal potential of fruits of ***N. physaloides***. Still more studies are needed on its toxicity.

Keywords: *Nicandra physaloides*, Fruit, Less Known, Wild, Edible.

INTRODUCTION

Fruits are generally acceptable as the good source of nutrients and food supplement for food in a world faced with the problem of food scarcity. Wild fruits also constitute the source of nutrients especially to the rural population [1] and can be a source of micronutrients; hence knowledge about their nutrient potential is imperative.

Nicandra physaloides (L.) Gaertn. is known as Apple of Peru as it is a native of Peru, now introduced in Mediterranean region. It grows as a weed frequently on plains and commonly known as 'Dhodana' or 'Ran Popti' in Maharashtra. *N. physaloides* is much branched glabrous herb with ovate-elliptic leaves, blue extra axillary flowers; yellow berries, 1.4–1.8 cm across, seeds brown, flat, numerous.

N. physaloides leaf, fruit, stem and root show strong antimicrobial activity especially against the some pathogens of digestive tract [2]. Leaves have been reported to possess diuretic and narcotic properties [3]. Leaves and fruits are also reported to be edible after boiling [4-6]. Boiling removes the toxicants; therefore it must be kept in mind that while promoting wild vegetables, traditional recepies should strictly be followed.

Objective of the present study is to understand nutritional potential of fruits of this species as no such studies have been done on this species.

Fig. 1: Flowering and fruiting branch of *Nicandra physaloides*

MATERIALS AND METHODS

Plants were brought to laboratory, thoroughly washed and surface dried under cool air current. For analysis fresh material was preserved at 4 °C, while dry powder was made of shade dried plants. For nutritional evaluation moisture content, crude fibre, total carbohydrates, starch, reducing and non-reducing sugars, crude protein, nitrogen and phenols, vitamins and pigments (antioxidants) were quantitatively estimated [7, 8]. For evaluation of medicinal properties, plant tissue was tested qualitatively for various bioactive compounds [9-15].

Plant ash was prepared; qualitative analysis was done to detect various minerals [16, 17] and quantitative estimation was done by flame photometer All assays were carried out at least in triplicate and values were obtained by calculating the average of three experiments and data are presented as mean±SEM.

RESULTS AND DISCUSSION

With the increasing awareness about health it becomes necessary to search the food with richness in various nutrients. The values of nutrients obtained were converted into 100 gm fresh weight of tissue (table no. 1). Food plants that provide more than 12% of their calorific value of proteins are a good source of protein [18], in *N. physaloides* fruit protein value is 10.72% (~ 11%) therefore can be considered as the good protein supplement. Vitamins are needed for proper functioning of body; *N. physaloides* fruits were rich in carotenoids, vitamin–A and vitamin–C (Ascorbic acid) content (table 2). Carotenoids and Ascorbic acid are not produced by the human body; therefore they need to be obtained through diet [19, 20].

Table 1: Nutrients per 100 gm fresh tissue

S. No.	Nutrients	Fresh weight
1	Moisture content	77.36 %
2	Crude fiber (gm)	6.56±0.01
3	Carbohydrate	
	a. Total Carbohydrate(gm)	0.604±0.009
	b. Starch(gm)	0.220±0.03
	c. Reducing sugars(gm)	0.194±0.3
	d. Non-reducing sugars(gm)	0.190±0.05
4	Crude Protein(gm)	1.124±0.2
5	Protein (N x 6.25) (gm)	2.428±0.02
6	Total Nitrogen*(mg)	0.384±0.04
7	Crude fat (gm)	0.815±0.06
8	Lipids (gm)	2.54±0.6
9	Food energy K. cal	16.26±0.4
10	Mineral content(gm)	5.6±0.3

Carotenes protect the skin from UV radiation. In addition to provitamin A activity, β–carotene act as an antioxidant that protected against cancer [21-23], heart diseases [24-26], macular degeneration [27] and ageing [28]. Ascorbic acid is well known as an essential nutrient because of its curative effect on scurvy, caused by a deficiency of vitamin–C since 1747 [29-31].

Table 2: Vitamins per 100 gm fresh tissue

S. No.	Vitamins	Result
1	Ascorbic Acid(Vitamin-C)	1.10±0.7 mg
2	Carotenoids (pro vitamin–A)	29±0.8 mg
3	Vitamin-A	49995±1.6 IU
4	Retinol	15±1.2 mg

In recent years plant containing antioxidants are in great demand as they inhibit the oxidation of organic molecules, are very important, not only for food preservation, but also for the defense of living systems against oxidative stress [32]. *N. physaloides* were found to be the good source of antioxidants like lycopene, anthocyanin, chlorophyll and phenols (table 3). Eating food rich in chlorophyll has the added benefit of correcting excess acidity and thus reducing the incidence of ill health and osteoporosis [33]. Phenolic antioxidants interrupt the propagation of the free radical autoxidation chain by contributing a hydrogen atom from a phenolic hydroxyl group, with the formation of a relatively stable free radical that does not initiate or propagate further oxidation processes [34].

Table 3: Antioxidants per mg/100 gm fresh tissue

S. No.	Antioxidants	Result
1	Lycopene	5.92±0.3
2	Anthocyanin	0.896±0.03
3	Chlorophyll	
	Chlorophyll-a	2.58±0.4
	Chlorophyll-b	2.34±0.5
	Total Chlorophyll	4.91±0.1
4	Phenols	0.0019±0.06

Minerals form an important part of nutrition. Mineral content was estimated in terms of ash yield. Ash analysis was done following nutritional as well as pharmacognostic parameters (table no. 4).

Table 4: Qualitative and quantitative mineral profile (mg/100 gm dry wt)

S. No.	Minerals	Result	
		Qualitative	Quantitative
1	Phosphorus	++	51±0.2
2	Sodium	++	44.6±0.2
3	Calcium	++	56±0.3
4	Potassium	++	2016±0.5
5	Iron	+	8.11±0.03
6	Sulphur	++	--
7	Magnesium	+++	--
8	Aluminium	+	--

Screening of *Nicandra* fruits for bioactive molecules showed the presence of alkaloids, steroids, tannins, and polyoses which respectively possesses the central nervous system depressant, anti-diabetic, anti-inflammatory, antioxidant, antinutritional, anti-allergic and anti-wrikle properties. This makes the species therapeutically more important.

When compared with the nutrient values of some conventional fruits (table no. 5) It showed that at least in certain respect fruits of *Nicandra* are more nutritional. Protein and fat content is higher than that reported in *L. esculentum, P. ixocarpa and P. peruviana.*

Table 5: Comparative nutrient values of fruit vegetable per 100 gm fresh weight

	Nicandra physaloides	***Lycopersicon esculentum***	***Physalis ixocarpa***	***Physalis peruviana***
Moisture	77.36	94.9	91.7	82.9
Crude Fiber (gm)	6.56	0.8	0.6	3.2
Protein (N x 6.25) (gm)	2.428	0.9	0.7	1.8
Fat (gm)	0.815	0.2	0.6	0.2
Carbohydrate (gm)	0.61	3.6	5.8	11.1
Vitamin–C (mg)	1.15	27	02	49
ß–Carotene (mg)	30	351	48	1428
Minerals (gm)	1.26	0.5	0.6	0.8
Calcium (mg)	12.67	48	7	10
Phosphorus (mg)	11.65	20	40	67
Sodium (mg)	10.14	12.9	0.4	0.9
Iron (mg)	1.84	0.64	1.4	2.0
Potassium (mg)	456	146	243	320

* Values from Gopalan *et al.*, 2004 (NA–values not available)

Similarly the fruits have high crude fibre content than others. Intake fibre can stimulate weakening hunger, increasing excretion of bile acids, risk of coronary heart diseases, hypertension, diabetes [35-37]. The concentration of minerals was found to be higher than those of *L. esculentum, P. ixocarpa and P. peruviana.* It is shown that the plant is a good source of micronutrient. Iron content was found to be higher than *L. esculentu* and *P. ixocarpa* while nearer to the value of *P. peruviana.* Iron is an essential for hemoglobin formation, normal functioning of the central nervous system and in the oxidation of carbohydrates, protein and fats [38]. Calcium and sodium content are higher than *P. ixocarpa and P. peruviana.* Potassium content is maximum than all the fruits compared.

CONCLUSION

The study confirmed the nutritional as well as medicinal potential of fruits of *N. physaloides*. Many fruits from the family solanaceae are exploited for edible purpose, advocacy of *N. physaloides* fruits as a new source of edible fruit enrich the healthy fruit basket. It would become the easy source of nutrional supplement due to their simple cultivation through seeds. Still the more studies are required on its toxicity.

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CONFLICT OF INTERESTS

Declared None

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