Original Article

Highlighting the Nutritional and Medicinal Value of *Asparagus* along with its Cultivation Practices

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Abstract

Background: *Asparagus officinalis* L commonly known as kurilo was profound to carry nutritional, medicinal, and economical aspects. Despite its enormous development in the world context, Nepal was still found lagging behind its existence. **Aims and Objectives:** A study shows that *Asparagus* was not any new plant to Nepalese, it grew well in the subtropical vegetation of the hilly and Terai regions of our country through its length and breadth naturally, but its importance was still undervalued. **Materials and Methods:** Comprising about 300 species including both wild and edible species, *Asparagus* is a plant of marine habitats owing a very modified shoot system that primarily adapts itself for various purposes of a plant to survive such as climbing, protection, adaptation in arid habitat, and many more. Furthermore, the review dealt with the cultivation practices which, in turn, highlighted the virtue of its methods that should be included for getting *Asparagus* more and more economically excellent. **Results:** Study and data accounted acknowledged that *Asparagus* farming is not getting the kind of attention, techniques, and interest of people that it needs to get. **Conclusions:** The wild free species growing randomly in the deep woods of our forest is the ground for the possible prospects of *Asparagus* farming which indicates its immense future only if manipulated correctly

Keywords: Blanching, crop geometry, folates: asparagine, spurs

Introduction

Asparagus (*Asparagus officinalis* L.)[1] being a herbaceous perennial[2,3] commonly entitled as kurilo in Nepal. *Asparagus* carrying multitudinous nutrition has been used as second vegetable[4,5] because it is owing to distinct flavor and succulent spring stalks whichin medicine its diuretic properties and its assumed function as an aphrodisiac throughout the world.. English word "*Asparagus*" is derived from classical Latin, but the plant was once designated as sperage which was further derived from Medieval Latin "sparagus" (The French Chef, 2016). *Asparagus* being genus of the family *Asparagaceae* primarily originated from temperate Europe and Asia[6] where it has been cultivated for over 2000 years. It comprises up to 300 species from which most of them are evergreen long-lived perennial bushes or climbing plants. The use of *Asparagus* as a herbal plant and its evidence of trading as a herbal medicine have been reported by some studies.[7]

The tender shoots of *Asparagus* called spears are often used as vegetables and in the preparation of soups and salads. The key reason behind its influence in the medicinal world is the crystalline substance called asparagine[8] contained by tender shoots that carry the diuretic properties and frequently used in cardiac dropsy and chronic gout.[7,9] In Nepal, it is grown in limited quantity and covers 152 hectares of the total land with an annual average production of 1175 metric tons.[10] *Asparagus*, being a subtropical plant, are found easily in forests of the hilly and Terai regions of Nepal. Thus, Kavre, Bhaktapur, Lalitpur, Kathmandu, Dhading, Morang, Sunsari, and Kaski are the utmost *Asparagus* producing districts of Nepal.[10] The top *Asparagus* importers were the United States (214,735 tonnes) followed by Germany (24,484 tonnes) and Canada (19,224 tonnes), while China is the major producer in the world by far with 7,845,162 tonnes (2017) followed by Peru with 383,098 tonnes and Mexico with 245,681 tonnes.[11]

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Comparing to other countries, though Nepal has a sufficient climate for *Asparagus* cultivation and even its wild forms are reported, commercialization is still facing a lot of constraints. This article focuses on the significance of *Asparagus* from a nutritional and medicinal point of view and also focuses on agronomic practices for promoting *Asparagus* cultivation.

Botany

Asparagus species may be erect or climbing, more or less woody. Being a perennial plant, *Asparagus* is usually dioecious; male and female flowers on separate plants, but sometime hermaphrodites, are also accounted. Being herbaceous, they are adapted to growing to a height of 100–150 cm tall with much-branched stout stems.[2,3,12] Leaves are narrow and needle-like called cladodes (modified stems) owing small scales, and the adventitious root system is encountered with fasciculated root type occurring horizontally inside the soil; also, the crown is made up of rhizomes and roots.[2] Flowers are bell-shaped, greenish-white to yellowish 4.5–6.5 mm long with six petals fused at the base. Fruits of *Asparagus* are of the red color of berry type that is poisonous to humans.[13] Since *Asparagus* often originates in marine habitats, it thrives in soils that are too saline for other plants to grow. The best soil types for *Asparagus* are deep, loose, light clays with much organic matter.[14,15] Entire shoot systems are often modified into climbing, protection, adaption to arid habitats, water, and food storage. Till now, there are only three types of *Asparagus* found: green, white. and purple. Purple *Asparagus* was originally developed in Italy and later on commercialized under the variety named "Violetto d' Albenga." Purple *Asparagus* is sweeter and slightly thicker than the green and white ones and contains caffeic acid.[16] Green and white *Asparagus* are quite similar in the context of taste, texture, and size. Green *Asparagus* got their green color due to photosynthesis, while whiter ones got their texture due to growing in dark, typically white *Asparagus* is more expensive because of its limited supply. Moreover, *Asparagus* is also considered as a useful companion plant specifically for tomatoes as tomato repels *Asparagus* beetle and, in turn, *Asparagus* may repel harmful nematodes that affect tomato plants.[17-19]

Nutritional and Medicinal Importance

Asparagus has been widely used as medicine and food since ancient times. Due to its huge nutritional as well as medicinal importance, people prefer it more day by day. The recommended daily intake of *Asparagus* is shown in Table 1.[20] Furthermore, the composition of nutrition present in *Asparagus* as reported by the USDA nutrient database is shown in Table 2. The regular and adequate consumption of *Asparagus* helps to increase in blood clotting and this is due to the higher amount of folates present.[21] The presence of different phytochemicals anticancer activity of bones and lungs,[21] blood, breast and renal lead to a positive test for antimicrobial and antibacterial activity.[22,23] A positive test for antimicrobial and antibacterial activity has been reported.[21]

Table 1: Adapted from Rickman *et al*. (2007)

Principles	Nutrient Value
Calories	20
Protein (g)	2.2
Fat (g)	0.2
Fiber (g)	1.8
Vitamin C	12% of the RDI
Vitamin A	18% of the RDI
Vitamin K	57% of the RDI
Folate	34% of the RDI
Potassium	6% of the RDI
Phosphorus	5% of the RDI
Vitamin E	7% of the RDI

RDI: Recommended daily intake

Table 2: Nutrient composition of *Asparagus*

Principles	Nutrient value	Principles	Nutrient value
Energy (kcal)	20	Folates (µg)	52
Carbohydrate (g)	3.38	Niacin (mg)	0.978
Total fat (g)	0.12	Pantothenic acid (mg)	0.274
Dietary fiber (g)	2.1	Pyridoxine (mg)	0.091
Protein (g)	2.20	Riboflavin (mg)	0.141
Vitamin E (mg)	1.13	Thiamine (mg)	0.143
Vitamin K (µg)	41.6	Vitamin A (IU)	756
Vitamin C (mg)	5.6	Sodium (mg)	2
Calcium (mg)	24	Potassium (mg)	202
Copper (mg)	0.189	Phosphorus (mg)	52
Iron (mg)	1.14	Selenium (µg)	2.3
Magnesium (mg)	14	Zinc (mg)	0.54
Manganese (mg)	0.158		

The evidence of the use of *Asparagus* has also been reported from different ethnobotanical researches. *Asparagus racemosus* has been found to use as a coolant during the hot season,[7] diabetes,[24] increase in lactation in pregnant women,[9] galactagogue, and aphrodisiac root.[25] Some other medicinal benefits of *Asparagus persicus Baker* or *Asparagus* sp. as reported by some studies[2] are tuberculosis, measles, diarrhea, epilepsy, liver problems, diuretic, and antispasmodic, while Asparagus officinalis is perfect for throat infections, chest pain, as a facial wash and sun cream, and for stomach problems.[26,27]

Cultivation Practices of *Asparagus*

Asparagus being a perennial vegetable, its fruit start from next year of planting. Fruiting includes soft tender shoots[15] growing around the plants. An agronomic package deals with planting time, raising of plants and planting materials, seed rate, intercultural operations, manuring, and fertilization, as shown in Table 3.

Asparagus farming can be done in a North slope facing area with frost-free up to 1300 masl.[28] For the farming of *Asparagus*, planting materials are the most necessary one and can be propagated through seeds, crowns, and bulbs,

Table 3: Basic information on *Asparagus* cultivation practices

Parameters	Description	References
Agro-climatic zones	Tropical to subtropical regions up to 1300 m with substantial dry regions to induce dormancy	[28]
Planting season	May–July, July–November	[29]
Planting materials	Seeds, crown, and bulbs	[14,29]
Seed rate	3–4 kg/ha	[29]
Manuring and fertilization	Fym: 30–40 tons/ha, 80 kg N, 60 kg P, 40 kg K And well rotten oil seed cakes	[29]
Intercultural operations	Blanching, irrigation, and weed management	[3,11,14,29]

but the most convenient and faster mode is to multiply using crowns.[3,11,15] A 3–4-month-old crown is selected for the planting of *Asparagus* during March–May in hills and from July to November in Terai.[30] Although crowns are selected, there are also benefits of selecting seeds for planting. Seed planted *Asparagus* contains all male plants and are more fruiting than that of crowns, though delay fruits are free from *Asparagus* trauma.

Crop geometry is necessary to maintain the optimum plant population and for optimum yield. While for transplanting a 1-year-old crown from seed are placed at depth of 20 cm furrows spaced 1.5–2 m and 45–60 cm between the rows.[29]

Intercultural operations include blanching which is the molding of soil to a height of 20–25 cm over the rows is practiced to blanch the young spears and get white Asparagus for canning. For the production of white *Asparagus*, blanching is followed. Irrigation at a duration of 12–15 days is found beneficial in *Asparagus*.[29] However, *Asparagus* is very sensitive to weeding. Competition of plant and weed results in a drastic loss in yield, so care should be taken that no weed is grown in the farm.[28] Organic mulch can be used for weed control and to reduce moisture loss, but plastic mulch is not beneficial as it prevents the growth of new shoots. A well-fertilized intensively cared *Asparagus* yields about 25–30 qtls of spurs/ha, but the national yield of spurs/ha is only 4–10 qtls/ha in Nepal.[10]

Conclusion

Asparagus is one of the important vegetables among perennials due to its high nutritive value and also used significantly in the treatment of various diseases from skin infections to cancers. Shoots of *Asparagus* are well known for their consumption as a vegetable and salads. Although the cultivation practices and people's knowledge toward it are low, researches should be done and on-farm trial and off-farm trail researches should be promoted. For the utilization of marginal lands and land with a high nematode population, *Asparagus* cultivation should be suggested as nematodes showed a negative response in the presence of *Asparagus* in soil.

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Conflicts of interest

There are no conflicts of interest.

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