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ABSTRACT

Asparagus is a member of liliaceae family and botanically known as *Asparagus officinalis* L. It is a perennial herb growing to 100–150 cm (40–60 in) tall, with stout stems with much-branched, feathery. The plant with various bioactives and has been widely used as medicine and food since ancient times. Its young shoots spears are used as a spring vegetable. Asparagus contains various phytochemical compounds such as polysaccharides, polyphenols, anthocyanins and saponins, which exhibit anti-cancer, anti-tumor, antioxidant, immunomodulatory, hypoglycemic, anti-hypertensive and anti-epileptic effects through in vitro and in vivo experiments. However, it is critical to bridge the gap between bioactive components and human health and to uncover their corresponding mechanisms.

INTRODUCTION

Asparagus consisting of three hundred species is a large genus belongs to liliaceae family, of which twenty are native to India. Its plants are erect under shrubs, rarely herbs. Root stocks are stout, creeping, sometimes bearing tubers. Leaves are minute. In India, two species of asparagus namely *Asparagus officinalis* L. and *A. racemosus* are most commonly cultivated. Asparagus is cultivated for the tender shoots, commonly known as spears, which has an agreeable flavor after it has been boiled. It is a long-time crop because (i) it is grown for about 3 years before it is cut in quantity and (ii) with good care it yields well for 10-15 years. Some plants might live longer, but when a large percentage become weak it is wise to discard the crop. There is a gradual increase in yield usually for 6-7 years after planting, yield is maintained upto about the twelfth year, after which the yield declines gradually. The best quality yield was obtained from the fourth to tenth year.

Asparagus officinalis L. it is known as Halgun, Halyun, Hillua and shatawar and it is cultivated for its tender shoots. Asparagus is one of the most delicate, wholesome and appetizing products of the home gardens. It gives economic yield after three years and continues to grow up to several years.

Asparagus is perennial, dioecious herb with erect branched stem growing 1 to 3m tall. The underground part consists of rhizomes or the crowns and their lateral extensions, fleshy and fibrous roots. The buds are borne on the crowns, arranged in compact order on the upper surfaces. The aerial stems, which constitute the edible spears, arise from the previous year on the rhizomes. The fleshy roots arise from the crowns and may spread widely and deeply.

They continue to elongate for 3-4 years and function chiefly as storage organs and slightly as absorbers; they store the food that is made in the leaves and stems, and give this up to the shoots in spring. New fleshy roots arise each year behind the terminal buds of the rhizomes and replace the old fleshy roots that die. Fibrous roots arise from fleshy roots in great profusion. They develop in spring and summer and die in late fall, having functional solely as absorptive organs of moisture and nutrients from the soil. Their spread is wide and deep. The rhizomes branch and elongate a few inches each year, more rapidly in young plants than in older ones.

Nutritional value

It is low in food energy and very low in sodium. It is a good source of vitamin B₆, calcium, magnesium, and zinc, and a very good source of dietary fibre, protein, beta-carotene, vitamin C, vitamin E, vitamin K, thiamin, riboflavin, rutin, niacin, folic acid, iron, phosphorus, potassium, copper, manganese, and selenium, as well as chromium, a trace mineral that regulates

the ability of insulin to transport glucose from the bloodstream into cells.^[1] The amino acid asparagine gets its name from asparagus, as the asparagus plant is relatively rich in this compound.

Table-1. Nutritional value of 100 grams' edible portion (spears) and per cent Daily value

| Sr. No. | Particulars | Quantity | Per cent daily value |
|---------|---------------------------|-----------|----------------------|
| 1. | Calories | 20.00 Kcl | 1% |
| | a. From Carbohydrates | 13.60 Kcl | |
| | b. From fat | 1.0 Kcl | |
| | c. From protein | 5.40 Kcl | |
| 2. | Carbohydrates | 4.0 g | 1 % |
| | a. Dietary Fibre | 2.1 g | 8 % |
| | b. Sugars | 1.9 g | |
| 3. | Protein & Amino Acids | 2.2 g | 4 % |
| 4. | Fats & Fatty Acids | | |
| | Total fat | 0.1 g | |
| 5. | Minerals | | |
| | a. Calcium | 24.0 mg | 2 % |
| | b. Iron | 2.1 mg | 12 % |
| | c. Magnesium | 14.0 mg | 3 % |
| | d. Phosphorus | 52.0 mg | 5 % |
| | e. Potassium | 202 mg | 6 % |
| | f. Sodium | 2.0 mg | |
| | g. Zinc | 0.5 mg | 4% |
| | h. Copper | 0.2 mg | 9% |
| | i. Manganese | 0.2 mg | 8 % |
| 6. | Vitamins | | |
| | a. Vitamin A | 756 IU | 15 % |
| | b. Vitamin C | 5.6 mg | 9 % |
| | c. Vitamin E | 1.1 mg | 6 % |
| | d. Vitamin K | 41.6 mcg | 52 % |
| | e. Thiamine | 0.1 mg | 10 % |
| | f. Riboflavin | 0.1 mg | 8 % |
| | g. Niacin | 1.0 mg | 5 % |
| | h. Vitamin B ₆ | 0.1 mg | 5 % |
| | i. Folate | 52.0 mcg | 13 % |
| 7. | Water | 93.20 g | |



Source <https://nutritiondata.self.com/facts/vegetables-and-vegetable-products/2311/2#ixzz75mGOvNSP>

Percent Daily Values (%DV) are for adults or children aged 4 or older, and are based on a 2,000 calorie reference diet. Your daily values may be higher or lower based on your individual needs.

Uses

The new succulent shoots (spears) which come every year constitute the asparagus of commerce and large quantities are canned. Asparagus is freshly cut and served as one of the most delicate items. It is used as vegetable and also eaten green. The spears are treated as a delicacy in preparation of soup and other vegetable products. Large quantities of asparagus spears are canned and frozen. Asparagus is also preserved in cans or bottles, but the home grown products thus dealt with are far exceeded in quantity by the canned asparagus. It is considered to be a good diuretic and is used especially in cardiac dropsy and chronic gout.

The parts used as vegetable consist of the aerial stems or spears, arising from rhizomes. *Asparagus* spears are widely used as a vegetable, and are frequently blanched before use. Extracts of the seeds and roots have been used in alcoholic beverages, with the maximum levels averaging 16 ppm. The seeds have been used in coffee substitutes, diuretic preparations, laxatives, remedies for neuritis and rheumatism, to relieve toothache, to stimulate hair growth, and to treat cancer. Chinese medicine has used them to treat parasitic diseases. Extracts are said to have served as contraceptives and extracts to cleanse the face (Chin *et al.*, 2002).

Varieties

Varieties of asparagus are broadly divided into two groups,

1. With green coloured spears : more popular and mainly used in fresh market
2. With white or light green coloured asparagus- mainly used for processing.

The male hybrids are more productive and do not produce seed which sprouts to become a weed. Jersey Gem, Jersey Giant and Greenwich produce superior yields in North Carolina. Jersey Gem has the added benefit of having tolerance to the disease *Cercospora* leaf spot. The increased yields of hybrids make them worth the extra seed cost.

Perfection: It is Recommended by IARI, New Delhi. It is an early, uniform, productive variety, delicious with high food value. The spears are large, green, succulent and light tipped. Average yield is 80-100 q/ha.

Selection-841: Bush type, medium, uniform plants and productive. The spears are 15-20 cm long, succulent, tender, green with better flavour and suitable for soup preparation. Yield is 90-110q green spears/ha. Despite these varieties, UC-72, UC-66 and Sel-831 are also grown in Kashmir, India.

Production technology

It is adaptable to temperate regions where low temperature or drought give the crop a rest period. The optimum range for germination is 16 to 30 °C, if temperature goes less than 10 °C stops the germination. It is a thermos-sensitive crop required cool season. Rhizome buds form at temperatures between 16 and 32 °C. Asparagus is frost sensitive so areas subject to late spring and early fall frost, should be avoided. During dormancy period asparagus crowns are rarely harmed by winter cold.

This plant requires a good water supply but will not tolerate waterlogging condition. The preferred soil is deep, reasonably free of



stones and gravel, loose, a fine loamy sand to sandy loam with rich in organic matter. Heavy soils such as clay loam should be avoided for its cultivation. It will grow in most soils as long as they are well-draining and will grow optimally at a pH between 6.5 and 7.0. Field should not have had asparagus production in the past. This crop requires a rooting depth greater than 1.5 m.

The asparagus can be raised from seeds sown in nursery than transplanting and planting of crowns from the old plants. Growing asparagus from seed is time consuming and labor intensive than growing from divided crowns. The crop raised from seeds produces spears late as compare to grown from crowns. The seeds sown in hills from March to May and in plains from July to November.

Seeds should be sown in mix, planting 0.6 cm (0.25 in) deep. The seeds should be kept moist, but not wet and will germinate in approximately 3 weeks. Seedlings should be fully hardened off prior to planting outdoors, using a cold frame where possible. Asparagus plants should be plant in shady place for 12 to 14 weeks before planting outside. This should be timed so that the outdoor planting date is after all danger of frost for your area.

The asparagus nursery bed should be prepared in advance by digging deeply to break up the soil and incorporating plenty of organic matter such as well-rotted manure and by blending a complete fertilizer into the soil just prior to transplanting. Plant the seedlings 25 to 38 cm (10-25 in) apart in a trench approximately 10 cm (4 in) deep. The trench should be gradually filled in as the seedlings grow. Keep the soil moist by providing about 2.5 cm (1 in) of water weekly. Once the plants are established, irrigation is generally only required in very dry areas due to the deep root system that the plant produces. It is important to control weeds as not only will it prevent any competition with the asparagus plant but it

will also ensure that the young spears can be seen and harvested at the correct time. The asparagus plants should be transplanted to their final planting site in the second year.

Raising crop by crown divisions choose disease-free, 1year old crowns from a reputable grower. All-male hybrids tend to be produce more spears than females and are a good choice for growing at home. Crowns should be planted once the soil has warmed to 10°C. Dig a trench 12 to 15 cm (5-6 in) deep and add super phosphate fertilizer to provide the crowns with nutrients immediately after planting. Position the crowns in the trench 30 to 45 cm (12-17 in) apart. The orientation of crown in the trench does not affect the growth as they will grow regardless. Backfill the trench to the original level. If planting more than one row, allow at least 1.5 m (5 ft) between rows. New spears should begin to emerge from the soil within a week of planting. Avoid harvesting the spears until the following year. Allowing the ferns to develop and provide energy for the crown to produce spears the following year.

Fertilizer management

The supplementing 50 % organic fertilizers can save the use of 50 % chemical fertilizers and promote the sustainability of the soil. Singh et al. 2013 suggested that the application of vermicompost 5 tonne ha⁻¹+50 % fertilizers 50:25:25 NPK kg ha⁻¹ for quality root production.

Harvesting and postharvest management

Allow asparagus ferns to remain until the Spring before cutting or mowing them back to the ground to allow new spears to grow. The new spears are ready to harvest when they reach 17 to 22 cm (7-9 in) in length. The spears can simply be snapped by hand close to the ground. The spears can be harvested every 2 to 4 days for a period of 4 to 6 weeks in the second year (third year if grown from seed). Avoid over-harvesting as this will



decrease the yield the following year. The harvest can be extended in the third year (fourth for seed grown plants) to 6-8 weeks.

Green asparagus is known to respond to controlled atmosphere storage (CA) at 20°C with increased shelf-life, reduced respiratory rate, slower loss of soluble carbohydrates and protein, and slower accumulation of asparagine. Spear can be stored in CA storage at 20°C for a week (Renquist *et al.*, 2010).

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