MARUMEGH

Kisaan E- Patrika

Available online at www.marumegh.com

 ISSN: 2456-2904

QUINOA CULTIVATION: CONTRIBUTE IN DOUBLING FARMERS INCOME

R.B. Solanki* Anshul Gupta and Jyoti Chohan

Sri Karan Narendra Agriculture University, Jobner, Rajasthan-303329

Email : radhikasolanki100@gmail.com

Quinoa (pronounced keen-wah) is one of the ancient food sources that have over the past decade, gained a large following. Quinoa is a grain that originated in the Peruvian Andes mountains. It was grown about 5000 years ago by the Quechua Indians who called it "the Mother of All Grains". Many researchers refer to quinoa as a **"pseudo cereal."** This term is typically used to describe foods that are not grasses but can still be easily ground into flour. The scientific name for quinoa is **"Chenopodium Quinoa"** family Amaranthaceae closely related to spinach and beets**.** Quinoa has a mild, slightly nutty flavor and is usually cooked using the same methods used for rice. It is high in protein and contains more amino acids and nutrients than most other grains. It is indigenous to South and Central America, widely grown in Peru, Chile and Bolivia.

There are numerous fancy facts about quinoa that will make you want to try it as a replacement for your usual rice and bread. There are two main reasons for eating it. Firstly, it's a completely gluten free food unlike other carbohydrate sources, such as pasta and bread. Secondly, it's a rich source of protein.

Introduction:-

Well, now days, people are talking about quinoa farming. What is quinoa? quinoa belongs to species Chenopodium album, which is commonly known as 'bathua' in the country. It is a rabi crop. Quinoa is a grain crop that is grown for its edible seeds. It is an annual dicotyledonous plant and grows about 1 to 1.5 meter in height. The main colours of quinoa are green, purple and red that change in different colour shades during maturation period. Cooked quinoa can be dried which lasts for several weeks. In India, quinoa farming has bright future due to its high protein content and less carbohydrates compared to rice. The challenge for Indian farmers is to get the seeds. Some people are importing quinoa seeds from South America and Mexico. Once, seed production of quinoa starts, the commercial farming of quinoa will be successful in India. Its The seed of quinoa is used in preparing various kinds of dishes, soups and chapati. Quinoa is also grown for the purpose of fodder (green manuring). Quinoa extract is also used in soaps, shampoo and body milk.

Common Names:- Quiuna, Parka, Dawe, Chuppah and Kinwa.

Nutritional Profile:-

Quinoa is food of high protein quality and is typically regarded as an adequate source of all essential amino acids, including lysine and isoleucine. It provides a variety of antioxidant phytonutrients, including ferulic, coumaric, hydroxybenzoic, and vanillic acid. Antioxidant flavonoids including quercetin and kaempferol are also especially plentiful in quinoa. Anti-inflammatory polysaccharides in quinoa include arabinans and rhamnogalacturonans. Many members of the vitamin E tocopherol family are provided by

quinoa, including important amounts of gamma-tocopherol. Quinoa is a very good source of manganese. It is also a good source of phosphorus, copper, magnesium, dietary fiber, folate, and zinc. It has a low glycemic index (GI) and excellent for diabetic people. It contain very high fiber content when compared to other grains. It is gluten free and good for people with gluten intolerance. It also helps in weight management.

Table 1. Comparisons of the nutritional quality (% dry weight) of quinoa with various grains.

Crop	% dry weight					
	Water	Crude Protein	Fat	Carbohydrates	Fiber	Ash
Quinoa	12.6	13.8	5.0	59.7	4.1	3.4
Barley	9.0	14.7	1.1	67.8	2.0	5.5
Buckwheat	10.7	18.5	4.9	43.5	18.2	4.2
Corn	13.5	8.7	3.9	70.9	1.7	1.2
Millet (Pearl)	11.0	11.9	4.0	68.6	2.0	2.0
Oat	13.5	11.1	4.6	57.6	0.3	2.9
Rice	11.0	7.3	0.4	80.4	0.4	0.5
Rye	13.5	11.5	1.2	69.6	2.6	1.5
Wheat (HRW)	10.9	13.0	1.6	70.0	2.7	1.8

Soil and Climate Requirement:- Quinoa is a hardy plant can be grown from sea level up to about 4,000 m. This grain can be grown in poor soils as well. However, the most suited soil for quinoa farming is sandy loam. Avoid heavy clay soils as they are not suitable. Frost causes the damage at flowering stage which results in yield reduction. Soils should have good drainage and high organic matter, with moderate slopes and average nutrient content. Quinoa prefers neutral soils although it is usually grown on alkaline soils up to pH of 9.0 and acidic soils up to pH of 5.0. Quinoa is a warm season crop that requires full sun. Best germination occurs when soil temperatures range from 65 to 75°F (18-24°C).The ideal temperature for quinoa cultivation is around 18°C to 20°C, although it withstands temperature extremes ranging from 39°C to -8°C.

Land Preparation and Sowing:- Land should be given couple of ploughings to make weed free and bring the soil to fine tilth stage. Quinoa crop can be sown from the mid of the May when soil temperature reaches 5 to 7 °C. Seeds can be directly sown in the main field or transplanted. The most appropriate plant density in quinoa farming ranges from 150 to 500 plants per sq.meter area. The row spacing depends on many factors. However, the most common row spacing is 50 cm or25 cm or 12.5 cm and recommended depth of sowing is 1 to 3 cm. Planting can be done by hand or with a row seeder. Generally, seed rate in quinoa farming is about 15 to 20 kg per hectare area. Usually seed germination occurs within 24 hours after planting when adequate moisture is present in the soil, and seedlings emerge in 3 to 5 days.

Irrigation:- Generally, rain fed crops do not require any irrigation if there is a well distributed rain-fall throughout the year.

Intercultural Operations:- If the quinoa crop is grown in wide row spacing then plants branch easily and their growth is hastened as well as the growth of weeds, therefore inter-row cultivation should be carried out. Usually, weeds should be removed mechanically in quinoa cultivation. When the plant reaches 20 to 25 cm, the first weeding is done, and also thinning

if the seedlings are clustered together or need to be moved to spaces with a greater availability of water.

Manures and Fertilizers:- Supplement the field with 20 to 30 tonnes of well rotten farm yard manure to enrich the soil with organic matter during land preparation. Quinoa crop responds well to nitrogen fertilizer. This crop requires chemical fertilizers of N:P:K in the ratio of 120 kg:50 kg: 50 kg per 1 hectare land.

Pests and Diseases:-

1. Tarnished plant bug, stem borer, flea beetles, aphids, leafhoppers, beet armyworm are common pests found in quinoa farming.
2. Fungal leaf spots, stalk rot, damping off, downy mildew, grey mold and bacterial blight are the common diseases found in quinoa cultivation.
3. Apart from insect pests and diseases birds are also common problem in the quinoa crop.

Selecting high quality seed cultivars with good pests & diseases resistance is primary task for preventing quinoa crop diseases.

Harvesting:

Quinoa is ready to harvest when the leaves have fallen, leaving just the dried seed-heads. Quinoa resists light frosts especially if the soil is dry. So long as maturing seed is past the green stage, frost will cause little damage and harvesting can be done a day or two later. It is important to watch the weather when quinoa is ready to be harvested: if rained on, the dry seed can germinate. If the heads are not completely dry, harvest them when you can barely indent the seeds with your thumbnail. They should then be thoroughly dried in a glass house, poly tunnel or warm dry shed before storage.

Amaranth keeps on flowering until hit by the first hard frost. Seed will often ripen many weeks before that, usually after about three months. The best way to determine if seed is harvestable is to gently but briskly shake or rub the flower heads between your hands and see if the seeds fall readily. (Numerous small and appreciative birds may give hints as to when to start doing this.) An easy way to gather ripe grain is, in dry weather, bend the plants over a bucket and rub the seed-heads between your hands.

Cutting and hanging plants to dry indoors does not work very well. The plants become extremely brittle and it is difficult to separate the seed from the chaff. The best time to harvest amaranth is in dry weather three to seven days after first frost—a condition not easily met in many places. Between 90 and 120 days after sowing, Quinoa reaches maturity. The leaves fall from the plants and the sun-dried, golden seed heads are ready for harvesting.

Post Harvesting:- Quinoa grains that contain appropriate grain moist should be separated from impurities, plant particles. The separated grains can be stored in a dry and cool place.

Yield:- Generally on an average yield of 500 kg to 1500 kg of grains can be expected. However, with proper farm management practices, fertilization and improved varieties, yield of up to 5 tonnes per hectare of quinoa grain can be achieved and green manure or fodder of 5 to 10 tonnes per hectare can be obtained.

Threshing & Winnowing:

Unlike beans or true grains, quinoa and amaranth have no hulls to remove. Quinoa seeds can be easily stripped upwards off the stalk with a gloved hand. The next task is to sieve the threshed material. Sieve through a standard 9 mm garden sieve. This will get rid of the courser material – straw bits, leaves and seed heads, keeping the material that has fallen through.

Later the fallen material can be sieved through a 3.5 or 4 mm sieve or colander. This will pass through the seeds + some finer material + dust. Through sieving process the dust can be separated through a standard 1 mm kitchen sieve or larger 1 mm fine garden or professional chefs sieve. Keep the material and seed left in the sieve.

Next winnow the seeds to remove the fine lighter material (chaff) from the heavier seeds. To separate the chaff from Amaranth and Quinoa, place the seeds and remaining rubbish in a wheel barrow and blow away the finer chaff using an air compressor or lay a plastic sheet out when there is a gentle wind and slowly drop the seed onto it at the wind ward end and the seed will drop nearest to you and the lighter chaff will blow downstream or do this indoors on a plastic sheet using an electric fan.

Preparation:

Quinoa is covered with a bitter substance called saponin, which helps to put birds off to some extent. Because of this coating, quinoa requires thorough rinsing before cooking. This neutralizes the saponin as well as enzyme inhibitors such as phytic acid very successfully. Amaranth has no saponin and no hulls, but it is still good to soak overnight in water and whey as for quinoa, to neutralize the phytic acid.

Scope:

Quinoa has already made an entry in India and could be a great source of nutrition for health conscious consumers while also giving better returns to the farmers. The Food and Agriculture Organization named 2013 as the International Year of Quinoa.

Rajasthan will start cultivation of quinoa and the crop popular in South America. On the experimental basis, the government has identified Bhilwara and Chittorgarh for its cultivation. If it remains successful, it will be cultivated in other parts of the state. The environment and condition here in Rajasthan is conducive to its growth, which is why the government is trying to make it popular among the farmers. A abundance of nutrition in it, it is called super food and mother grain. it can be grown in barren land and also in the areas which do not have much water. The crop of quinoa has the potential to survive in the event of drought. Besides, it is resistant to insecticides. It is full of carbohydrates, protein, vitamin and minerals. Also, it has a lot of fibre. It has four times more protein than milk, iron two times higher than spinach, four times higher folic acid than almonds, 16 times higher calcium that maize, seven times more magnesium than banana and four times higher dietary fibre than brown rice. In 100 grams of quinoa, there are 14 grams of protein, 7 grams of dietary fibre, 197 milligrams magnesium, 563 milligrams potassium and 0.5 milligrams Vitamin B-6.

In one hectare of land, around 5 to 18 quintals of quinoa can be produced. For its cultivation, there is no requirement of special training and also no special technique is required for it. Just like any ordinary cultivation of any crop, it can also be cultivated easily. The farmers can earn 20% more from quinoa crops as compared to the traditional crops. The cost of quinoa ranges from Rs 500 to Rs 1,000 per kilogram in the market. The rajasthan government will also plan to start a buyback guarantee scheme for quinoa in cooperation with export companies. With this aim, the government is making efforts to make quinoa more popular among the farmers to produce aplenty.

The Harvard University, there was a research which state that daily consumption of quinoa can provide benefit to patients suffering from heart diseases, cancer, respiratory diseases and other chronic diseases. Daily consumption of 35 grams of quinoa can help in controlling diabetes and reduces risk of cancer by 15%. In patients with chronic diseases, it decreases the risk of death by 15%.

References:

1. **Duane L. Johnson and John McCamant, (1987).** Quinoa Research and Development – Annual Report. 1988. Sierra Blanca Associates, 2560 S. Jackson, Denver, CO 80210.
2. **J.C. Risi and N.W. Galwey (1994).** The Chenopodium. Grains of the Andes: Inca Crops for Modern Agriculture. In*: Advances in Applied Biology,* Academic Press, and London.**10**:145-216.
3. www.agrifarming.in/tag/quinoa-cultivation-in-rajasthan