



QUINOA: A SUPERFOOD AND CLIMATE RESILIENT CROP FOR HIGHER INCOME IN VERTISOLS OF SOUTH-EASTERN RAJASTHAN

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Quinoa (*Chenopodium quinoa*) is an annual plant from amaranthaceae family famous for its edible seeds. Like amaranth seeds quinoa seeds are also categorized under pseudocereals as these grains are not from grasses like wheat and rice. Quinoa grains are intrinsically outstanding with respect to its nutritional quality, genetic variability, adaptability to adverse climate and soil conditions, and low production cost. These characteristics make quinoa one of the strategic crops that could be a potential contributor in ensuring food security and sovereignty (Zurita-Silva *et al.*, 2014).

Quinoa grains contain 13% water, 64% carbohydrates, 14% protein, and 6% fat in uncooked form (Gordillo-Bastidas *et al.*, 2016). High amount of protein, vitamins, minerals and essential amino acids (especially lysine) makes these grains nutritionally superior than many traditional cereals. Besides, the plant is known for its nutraceutical properties and considered as an excellent example of 'functional food' that can lower the risk of various diseases (Vega-Gálvez *et al.*, 2010). As these grains are easy to cook quinoa can add versatility in the nutritious food preparations of health conscious people.



Quinoa is mostly grown in the high Andean plateaus of South America, Peru, Bolivia and Ecuador. This crop is estimated to be cultivated in an area of around 86,000 hectares globally with an average total production of 125,000 metric tonnes. Recognising the importance of the crop in ensuring food security as well as the effort of the indigenous Andean people to preserve this food crop through ancestral practices The United Nations General Assembly declared 2013 as the “International Year of Quinoa”.

Major advantages of the crop are its resistance to insect pests, ability to grow well in barren, alkaline soils and also resistance to drought and ground frost. Quinoa seeds have a coating of saponin, a soapy chemical that has a bitter taste, which saves the crop from animal depredation. The chemical also acts as a natural pest control measure. In fact, due to high protein content, ease of use, versatility to different food recipes, and potential for high yield even under controlled environmental conditions, quinoa has been selected as an experimental crop in NASA's Controlled Ecological Life Support System for their long-duration human occupied space flights.

Adaptability of the crop to adverse farm field conditions makes this crop ideal for states like Rajasthan. Unlike millets, the state's staple grain, which turn out to be coarse or gelatinous when cooked, quinoa become fluffy with separate grains that make ideal for absorbing the flavours of foods when served.

In the southern region of Rajasthan, farmers started growing quinoa from

Rabi season of 2015-16 with the support of agriculture department. Though the crop performed well in the field wastage of the produce during processing (30-50 per cent) due to small seed size reduced the producer's share in the final market price of quinoa. For instance, the retail price of quinoa went up to Rs.1,000.00 per kg when farmer got hardly Rs.40-60 for one kilogram seed.

FIELD DEMONSTRATIONS ON QUINOA CULTIVATION BY ICAR-INDIAN INSTITUTE OF SOIL AND WATER CONSERVATION RESEARCH CENTRE, KOTA, RAJASHTHAN

Realising the importance of popularising the crop among the farmers, scientists of ICAR-Indian Institute of Soil and Water Conservation Regional centre, Kota conducted field demonstrations of the crop in the Vertisols of South-eastern Rajasthan during the *Rabi* season of 2017-18 (Figure 1,2,&3). Sowing was done on 25th November and 15th December. A line spacing of 45 cm and 30 cm were adopted for sowing and seeds were sown at a depth of 2-3 cm. Seed rate adopted was 5-6 kg/ha. As the crop does not require much fertility many nutrient inputs were not applied. One pre sowing irrigation was given to ensure proper germination and another irrigation was given after 55 days of sowing.



Figure 1. Farmers are made aware through field demonstration



Figure 2. Quinoa crop at early stage



The crop matured in 120 to 130 days and maximum yield was obtained from those fields where sowing was done at 45 cm spacing on 25th November. However, under late sown condition yield loss was compensated with narrow row spacing of 30 cm.



Figure 3. Quinoa crop at around 100 days after sowing

The cost of cultivation of quinoa was calculated as Rs.16000/ha. The net profit was calculated as Rs. 74000/ha with the selling price of Rs. 60/kg (buyback price of Govt. of Rajasthan).

CONCLUSION

Quinoa (*Chenopodium quinoa*) is becoming popular among farmers of India in recent years due to its drought resistance nature, wide adaptability to different environment and ability to yield high even in nutrient-poor soils. It has been also recognized as functional food due to its high nutritional value and already became a part of healthy diet recipes in the country. Moreover, ability of the crop to give higher net returns with less resource use making this crop a suitable alternative to resource poor farmers of the country at a time when the nation is heading forward with the aim of doubling farmers income. Hence, farmers may be encouraged to grow quinoa in resource poor or low fertile lands to get a reasonable net farm

income. Also, government agencies need to take necessary steps to ensure proper marketing of the produce.

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