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Knowledge Level of Farmers about Cultivation of Quinoa (*Chenopodium quinoa* Willd.) in Cold Arid Region of Ladakh

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ABSTRACT

The study investigated the knowledge level of farmers about the recommended cultivation practices of quinoa (a high value crop and potential option for crop diversification) in cold arid region of Ladakh.A total sample of 80 farmers was randomly selected from two villages (Thiksay and Stakana), where it was largely adopted by the farmers after its introduction in the region during 2016 onwards. The data were collected with the help of pre-structured interview schedule for the major cultivation practices during 2020. The knowledge level of farmers about timing of irrigation was observed highest followed by spacing, germination of seeds, thinning, recommended fertilizers, date of sowing, seed rate, first weeding, harvesting, market rate, and varieties of quinoa. Further, it was observed that majority of the farmers had medium level of knowledge about quinoa cultivation. It means that there is large scope for imparting training to the farmers about adoption of improved cultivation practices so as to increase the production of this highly remunerative crop and help in increasing the livelihood of farmers in the region.

INTRODUCTION

The union territory of Ladakh region has a large altitudinal range and exhibit diverse ecology and physiographic. Ladakh region (location: 32°00’ N to 80°00’ E; elevation: 2400 m to 4500 mMSL) is mostly mountainous and barren except villages and experience intense long winter season (Gupta and Arora, 2016). The climate of Ladakh provides a narrow window of hardly six months (May-October) for growing cereals, vegetables and other crops. The most important cereal crops grown traditionally in the region include barley, wheat and buckwheat. Thus, attempts were continuously made in the region during 2015-2017 to grow some other high value crops under crop diversification, which may emerged as an important alternative to attain the output growth and sustainability in the developing countries (Dasgupta and Bhoumik, 2014). In this direction, Quinoa (*Chenopodium quinoa* Willd) was observed as a crop that is though alien to Ladakh, but may suit well in the region. It is a flowering, herbaceous annual plant in the amaranth family, grown as a grain crop primarily for its edible seeds. It is a hardy plant and can be grown from sea level up to about 4,000 m in poor soils as well. However, the most suited soil for quinoa farming is sandy loam and not the heavy clay soils. Quinoa is typically consumed in the same way as the cereal grasses (wheat, oats, barley and rye) and is grouped together with these foods. However, quinoa

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is not a cereal grass at all, but rather a member of the same food family that contains spinach, Swiss chard and beets. It is also referred as a 'pseudo cereal' which is used to describe those foods that are not grasses but can still be easily ground into flour. It is used as a cereal, a feed grain, green or conserved fodder and its seed is known for its high nutritional value because of its unusual composition and exceptional balance between protein and crude fat and is an excellent example of 'functional food' that aims at lowering the risk of various diseases (Abugoch, 2009). Keeping in view the different advantages does quinoa have for Ladakh's population, different stakeholders including DRDO, CAZRI, SKUAST-Kashmir and different NGO's introduced cultivation of *Chenopodium quinoa* in the region because of its drought and frost resistance and requirement of small amount of water and nutrients for its nourishment. This has made Ladakh one of the best places in the world to grow quinoa because it is cold desert with deficiencies in water and nutrient content (Raj and Dwivedi, 2016). The field experimental trials conducted were successfully in the region and later on its field level demonstrations trials were also performed in different blocks of the region in farmers' fields from 2016-2018. The crop performed well and the grain yield was 20 times more than that sown. Its performance was observed better than all other grain crops like wheat and barley which yield at the most 7 to 8 times than that sown and the crop was finally adopted by farmers in different villages (Mishra, 2020). The popularisation of the cultivation of quinoa crop by different stakeholders in the region - as a potential crop for diversification had yielded excellent results during the last few years. The cultivation of the crop had shown horizontal spread in the Ladakh region but the local farmers are not following the recommended package of practices of this crop mostly because of lack of knowledge about these practices which is one of the most important prerequisite for adoption of a technology. The present study was conducted to know the extent of knowledge gained by farmers about cultivation of quinoa and its performance in the region.

METHODOLOGY

The study was undertaken purposively in Leh district of union territory of Ladakh during 2020. Two villages namely Thiksay and Stakana were selected for the study, because horizontal spread of the cultivation of high value crop - Quinoa was observed in these two villages after introduction of this high value crop in the region. A random sample of 80 farmers was selected for the study which included 40 farmers from each village. The data regarding the extent of knowledge level of farmers about package of practices of cultivation of quinoa crop, was collected with the help of pre-structured interview schedule and the care was taken to collect the correct and unbiased data. The extent of knowledge level of farmers about each major cultivation practice was assigned marks. One mark was assigned for each correct reply and zero to wrong reply or no reply. Frequency and percentage of respondents in each practice was also calculated. The practice wise extent of knowledge was determined on the basis of mean per cent score obtained for each statement and each practice was ranked accordingly. Besides, the farmer respondents of Quinoa were divided into three categories (high, medium and low level) on the basis of mean knowledge scores and standard deviation.

RESULTS AND DISCUSSION

The data presented in Table 1 depicts the knowledge level of the farmers in these two villages about the recommended cultivation practices of quinoa viz., varieties of quinoa, time of sowing, seed rate, spacing, germination of seeds, timing of irrigation, recommended fertilizers, first weeding, thinning, harvesting and market rate. The knowledge level of farmers about timing of irrigation was observed highest (53.75%) with a mean score of (0.53) followed by spacing (48.75%), germination of seeds (47.50%), thinning (45.00%), recommended fertilizers (43.75%), date of sowing (41.25%) seed rate (40.00%), first weeding (40%), harvesting (38.75%), market rate (37.50%) and varieties of quinoa (31.25%) with mean scores of 0.49, 0.48, 0.45, 0.43, 0.43, 0.41, 0.40, 0.40, 0.38, 0.37 and 0.31, respectively. Accordingly, practice-wise ranks were assigned to extent of knowledge possessed by the respondents about different cultivation practices on the basis of mean scores obtained as depicted in Table 1. The results were in agreement with the findings of Nain and Bhagat (2005), Slathia et al., (2011), Choudhary and Sharma (2012); Nain and Chandel (2013); Raina et al., (2014) who studied the knowledge level of different high value crops in different regions.

The data presented in Table 2 revealed the farmers' distribution according to their extent of knowledge about cultivation of quinoa in these two villages. The results observed that majority of the farmers (77.50%) had medium knowledge followed by 21.25 per cent with high knowledge and only 1.25 per cent of the farmers possessed low knowledge about quinoa cultivation. Similar findings were observed by Kumawat et al., (2020) who studied the extent

Table 1. Practise-wise knowledge level of farmers about cultivation of *Chenopodium quinoa.*

S.No.	Practices of Quinoa	Percentage	Mean Score	Rank	Standard Deviation
1.	Varieties of Quinoa	31.25	0.31	X	0.466
2.	Date of Sowing	41.25	0.41	VI	0.495
3.	Seed Rate	40.00	0.40	VII	0.492
4.	Spacing	48.75	0.49	II	0.502
5.	Seed Germination	47.50	0.48	III	0.502
6.	Irrigation Timing	53.75	0.53	I	0.501
7.	Recommended Fertilizers	43.75	0.43	V	0.499
8.	First weeding	40.00	0.40	VII	0.492
9.	Thinning	45.00	0.45	IV	0.500
10.	Harvesting	38.75	0.38	VIII	0.490
11.	Market rate	37.50	0.37	IX	0.487

Table 2. Categorization of respondents on the basis of their knowledge scores

Categories	Percentage
High (< 0.0.47)	21.25
Medium (0.47 to 0.53)	77.50
Low (> 0.53)	1.25

of knowledge of beneficiary farmers of Agriculture Technology management Quality Improvement Center (ATMQIC) project of Rastriya Krishi Vikas Yojana about *kharif* crop demonstrations in Jaipur District of Rajasthan.Choudhary et al., (2019) also studied the knowledge level of farmers about improved production technology of onion crops in Sikar district of Rajasthan and observed similar results.

CONCLUSION

Thus, it is concluded that the majority of the farmers had medium level of knowledge about the major cultivation practices of this high value crop. There is need to promote this crop by conducting awareness programmes about its cultivation on large scale so that it is adopted by the farmers in full and attain a permanent position in the cropping system already prevalent in the region. Since the crop is highly remunerative it will provide a livelihood source to the farmers in the region.

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