Studies on characterization of qualitative traits in quinoa (*Chenopodium quinoa* Willd)

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 Received: 03.06.2024/Accepted: 19.07.2024

ABSTRACT

Quinoa (*Chenopodium quinoa* Willd) is an important pseudo-cereal crop which contains essential amino acids and dietary fibres. Eleven qualitative characters were assessed for each of the seventeen genotypes of quinoa in the experimental area of Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh during rabi season 2021-22. Categorical differences were significant for all the characters except plant height, stem branching and leaf colour. Several of these characters are useful for genetic markers and farmers to protect their varieties, productivity and attractiveness in quinoa.

Keywords: Quinoa; characterization; descriptors; genotypes; traits

INTRODUCTION

Quinoa (*Chenopodium quinoa* Willd) is a dicotyledonous herbaceous annual species belonging to the family Amaranthaceae. It contains all nine essential amino acids and is a good source of dietary fibre. Quinoa cultivation in Chhattisgarh state remained negligible in terms of area and production; it is projected to achieve a high seed yield of 12-15 q per ha (Yadav 2018). Characterization requires knowledge of genetic diversity of traits to facilitate designing of efficient strategies. There is no research work done to characterize and evaluate DUS characters for quinoa. Hence, an attempt was made for the characterization and evaluation for quinoa.

MATERIAL and METHODS

Seventeen genotypes including one check (Himpriya) were evaluated in randomized block design with three replications in the experimental area of Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh during rabi season 2021-2022. Seed material was obtained from All India Coordinated Research Network on Potential Crops, ICAR – National Bureau of Plant Genetic Resources, New Delhi. Each genotype was sown in a plot size of 3.0 m x 0.6 m keeping row to row and plant to plant spacing of 30 cm x 15 cm for each plot in each replication. All agronomic practices were followed during the crop growth period. Data were recorded on 11 characters (Table 1) using character descriptors as outlined by Anon (2015).

RESULTS and DISCUSSION

The data on 11 qualitative characters of quinoa are presented in Table 1. Among seventeen genotypes, fourteen genotypes showed significant differences for all traits except plant height, stem branching and leaf colour. One genotype recorded poor, 7 genotypes with check good and 9 genotypes very good early plant vigour. For inflorescence colour, 11 genotypes with check were observed yellow green, 2 reddish and 4 genotypes pinkish-green. Thirteen genotypes with check were recorded for terminal inflorescence shape white and 4 were as panicled spike shape. For flower cluster, 5 genotypes with check showed lax and 12 exhibited dense flower clusters. Eight genotypes with check exhibited yellow stem colour, whereas, 9 exhibited other colours like green radish. For leaf tip, 13 genotypes were observed as obtuse, while, 4

Table 1. Frequency distribution and percentage value of qualitative traits in quinoa

Trait	Descriptor (parameter)	Genotypes	Number of genotypes	Frequency (%)
Early plant vigour	1 Poor	SHQ-3	1	5.88
	2 Good	EC-896275, EC-896237, EC-896213, EC-896276, CGQ 20-1, SHQ-1, Himpriya (C)	7	41.17
	3 Very good	EC-896208, EC-896069, EC-896079, EC-896246, EC-896201, EC-896065, SHQ-2, SHQ-4, SHQ-5	9	52.94
Plant growth habit	1 Erect	EC-896275, EC-896237, EC-896208, EC-896069, EC-896079, EC-896213, EC-896246, EC-896201, EC-896065, EC-896276, SHQ-1, SHQ-2, SHQ-3, SHQ-4, SHQ-5, CGQ 20-1, Himpriya (C)	17	100.00
	2 Semi erect	-	-	-
	3 Angled	-	-	-
	99 Others	-	-	-
Inflorescence colour	1 Yellowish green	EC-896237, EC-896069, EC-896213, EC-896201, EC-896276, SHQ-2, SHQ-3, SHQ-4, SHQ-5, CGQ 20-1, Himpriya (C)	11	64.70
	2 Reddish	EC-896079, EC-896065	2	11.76
	3 Pinkish-green	EC-896275, EC-896208, EC-896246, SHQ-1	4	23.52
	99 Others	-	-	-
Inflorescence shape	1 Globose	-	-	-
	2 Slender with auxiliary cluster	-	-	-
	3 Terminal	EC-896275, EC-896237, EC-896208, EC-896069, EC-896213, EC-896201, EC-896065, EC-896276, SHQ-3, SHQ-4, SHQ-5, CGQ 20-1, Himpriya (C)	13	76.47
	4 Panicled spike	EC-896079, EC-896246, SHQ-1, SHQ-2	4	23.53
Flower cluster	3 Lax	EC-896237, EC-896276, SHQ-2, SHQ-4, Himpriya (C)	5	29.41
	7 Dense	EC-896275, EC-896208, EC-896069, EC-896079, EC-896213, EC-896246, EC-896201, EC-896065, SHQ-3, SHQ-1, SHQ-5, CGQ 20-1	12	70.58
	99 Others	-	-	-
Stem branching	1 Unbranched	-	-	-
	2 Moderately branched	EC-896237, EC-896276, SHQ-2, SHQ-4, EC-896275, EC-896208, EC-896069, EC-896079, EC-896213, EC-896246, EC-896201, EC-896065, SHQ-3, SHQ-1, SHQ-5, CGQ 20-1, Himpriya (C)	17	100.00
	3 Profusely branched	-	-	-
	99 Others	-	-	-
Stem colour	1 Yellow	EC-896275, EC-896208, EC-896069, EC-896276, SHQ-3, SHQ-5, CGQ 20-1, Himpriya (C)	8	47.05
	2 Red	-	-	-
	3 Pink	-	-	-
	99 Others	EC-896237, EC-896279, SHQ-1, SHQ-2, SHQ-4 (green), EC-896213, EC-896246, EC-896201, EC-896065 (reddish)	9	52.94

Trait	Descriptor (parameter)	Genotypes	Number of genotypes	Frequency (%)
Leaf colour	1 Green	EC-896237, EC-896276, SHQ-2, SHQ-4, EC-896275, EC-896208, EC-896069, EC-896079, EC-896213, EC-896246, EC-896201, EC-896065, SHQ-3, SHQ-1, SHQ-5, CGQ 20-1, Himpriya (C)	17	100.00
	2 Red	-	-	-
	3 Pink	-	-	-
	99 Others	-	-	-
Leaf tip	1 Obtuse	EC-896275, EC-896237, EC-896208, EC-896069, EC-896079, EC-896213, EC-896246, EC-896201, EC-896065, SHQ-3, SHQ-1, SHQ-2, SHQ-4	13	76.47
	2 Rounded	-	-	-
	99 Others	EC-896276, SHQ-5, CGQ 20-1, Himpriya (C)	4	23.52
Leaf shape	1 Triangular	-	-	-
	2 Hestate	-	-	-
	3 Deltoid	-	-	-
	4 Cordate	-	-	-
	5 Ovate	-	4	23.52
	6 Oblong	-		- -
	7 Rhombic	SHQ-1, SHQ-3, SHQ-4, EC-896276, EC-896246, EC-896208, SHQ-5, EC-896201, EC-896275, EC-896213, EC-896069, CGQ 20-1, Himpriya (C)	13	76.47
	8 Deep unequally toothed	-	-	-
	99 Others	-	-	-
Seed colour	1 White	EC-896208, EC-896065, SHQ-2, EC 896213	4	23.52
	2 Pink	-		
	3 Brown	EC-896275, EC-896237, EC-896069, EC 896201, EC-896276, SHQ-1, SHQ-5, CGQ 20-1, Himpriya (C)	9	52.94
	99 Others	EC-896079, SHQ-4 (black), SHQ-3 (golden), EC-896246 (golden white)	4	23.52

including check were others. Four genotypes showed oblong leaf shape and 7 genotypes with check had rhombic leaf shape. For seed colour, 4 genotypes were recorded white, 9 as brown including check and 4 exhibited other seed colour. Plant growth habit, stem branching and leaf exhibited no variations in all genotypes. The characterization results revealed wide range of variation for most of the morphological parameters.

CONCLUSION

It can be concluded from the present study that the nutritional status of majority of people in post-pandemic period was inclined towards obesity, mainly due to a significant increase in the consumption of fat. Several factors such as staying indoors for long hours, relaxation from work stress and opportunity for more family time can be attributed for the presence of overweight and obesity in the population. The study also reiterated a state of health consciousness in people and a shift towards more healthy and immune boosting diets.

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