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Comparison of the Main Yield Components of Quinoa (*Chenopodium quinoa W.*) between the local variety and 4 varieties of Quinoa in Krasnodar Krai, Russia.

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Abstract

The study of elasticity and genetic plasticity of quinoa *(Chenopodium quinoa Willd.)* is very important for agronomy. There is only one variety very well adapted for 10 years in, Russia, , which is a standard in research in adverse climates. Based on this, the present research was carried out during 2022 was conducted in the experimental plot in The Quinoa Center Krasnodar , Russia was studied six parameters of agricultural yield in quinoa varieties (Kancolla, Seva, Amarilla marangani, Negra collana, Altiplano), were grown the statistical method of randomized blocks in an experimental area of 50 m2, with 3 blocks or repetitions and collection of experimental samples 12 plants per variety. The results showed significant differences between varieties: The Variety 2, “Seva” received a harvest of 70 g. and Variety 5, received a harvest of 90 g. “Altiplano”. The study also revealed that the late varieties were not successful in their adaptation and obtained poor yields “Kancolla” of 20.5 g “Amarilla marangani”13.3 (g) “Negra collana” 17.4 (g) on the contrary, the best agronomic yield was obtained by variety “Altiplano” showed a yield by plant of 90 grams/panicle. Quinoa is a mainly autogenous species. There is limited information on seed traits per genotype, i.e., 1000-seed weigh. A significant difference was observed among the genotypes of the selected the varieties “Altiplano” 3,7 (g) “Negra collana” 2,9 (g) with respect to all the measured parameters the variety local “Seva”. 3,1 (g). It was observed that The Productivity and yield components are: Plant panicle per m2. Weight of 1000 seeds, (g) . Yield per plant, (g). Vegetative cycle, (days). Panicle size (cm). Panicle maturation, (days). could be employed for improvement through crop improvement program.

Keywords: Crop Improvement Program; Quinoa; Phenotypic; Agro-Climatic; Quinoa Seed Storage

Introduction

Quinoa was a major food crop for the indigenous populations of South America before the Spanish conquest. Quinoa was domesticated by the indigenous people Quinua over 7000 years ago on the highlands of the Peruvian and Bolivian Andean area near Lake Titicaca Bazile, Jacobson et al., 2016 Fagandini Ruiz [1]; Miller [2]; Ruiz et al., 2014). Ecuador also has a long history of quinoa cultivation. Genetic analysis showed that the Ecuadorian landraces have their origins from the highlands of the Peruvian Bolivian and Bolivian Andes (Bazle et al., 2015). Comparative studies showed that genotypes from different regions including Bolivia, Peru, and Ecuador had different agronomic and phenotypic properties (Bazile et al., 2015). Even though there are many genotypes/varieties of quinoa reported from different regions, a lack of a definite list of quinoa varieties has created a degree of confusion among quinoa breeders (Andrews, 2017). The nomenclature of quinoa varieties with detailed background information remains to be standardized to facilitate the management of the genetic resources. There is great genetic diversity of quinoa on molecular and phenotypic levels. Such diversity allows quinoa to be adapted from its original growing environment to many different regions with significantly different agro-climatic and environmental conditions. Quinoa including organics and greens have been developed in different countries for food security and food production. Quinoa has potential as a space crop. Suitable storage conditions should be used to ensure the shelf-life of quinoa seeds. It is essential to develop collaborative network and initiatives among different stakeholders for quinoa production in different regions of the world. The genetic diversity in quinoa remains to be utilized to improve the agronomic performance and nutritional quality for food applications. Quinoa farming and cultivation should be sustainable, requiring government initiatives and regulatory farming policies Fan Zhu [3].

Quinoa seed storage is important to ensure long shelf-life Bakhtavar & Afzal [4]; Kibar & Temizel [5]. Quinoa seeds should be stored under suitable conditions Arslan-Tontul [6]. Bakhtavar & Afzal [4] analyzed the suitability of dry chain technology in quinoa seed storage. Quinoa was introduced into China in the 1960s. It has been under significant development during the last decade Shah [7]; Yang [8] (Figure 1). Quinoa cultivation has been conducted from an altitude of sea level to over 5000 m above the sea level (e.g., on the Tibetan plateau) in China. For example, a total of 15 quinoa accessions were planted and assessed for morphological and quality traits and for the adaption to the environmental conditions in the Northeastern part of China Shah [7]. The quinoa genotypes with higher grain yields had shorter and more compacted inflorescences and branches, whereas those producing more forage had more branches and intermediate plant height with thick stems in that part of China Shah [7]. A total of over 10 varieties have been registered by registration committees for production. Value-added quinoa products such as noodles, yogurt, and alcoholic beverage have been developed Yang [8]. In the quinoa development projects, genotypes with high performance were selected for future development and large-scale production. Overall, the new quinoa varieties selected during the plantation and breeding programs remain to be studied for their nutritional, sensory, biological, and chemical properties Angeli [9].

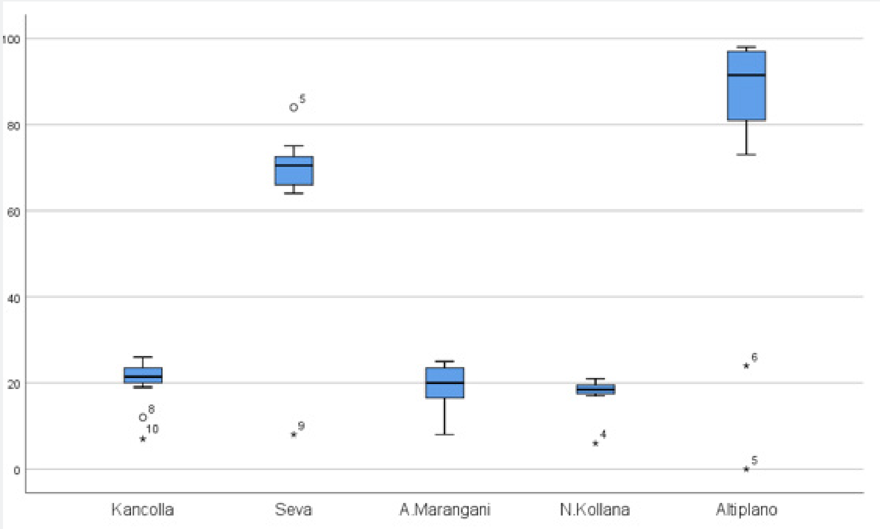

Figure 1: 60 samples in total: The lower samples determine plant mortality, for example: numbers 10, 9, 4, 5 these are samples with very low yields and are outside the lower quartiles.

Materials and Methods

This research was carried out during May to November 2022 at the experimental site of the quinoa center, located in the city of Novokubansk, Krasnodar Territory, Russia. The geographical coordinates of the location (45°06 'N 41°03' E) in the North Caucasus. Its height is 149 meters above sea level. The climatic conditions on average during the vegetation period are as follows: In mayo, the maximum temperature is 19 °C and the minimum is 10 °C with an intense rainfall of 157 mm. In June, the maximum temperature is 29 °C and the minimum is 19 °C with an intense rainfall of 62 mm. In July with a high temperature of 35 °C and little precipitation. In august, the maximum temperature is 32 °C and the minimum>m is 21 °C with rainfall of 37 mm. The months with adverse weather are as follows In September, the maximum temperature is 24 °C and the minimum is 14 °C with an intense rainfall of 69 mm. In October, the maximum temperature is 17 °C and the minimum is 12 °C with rainfall of 59 mm. In November, the maximum temperature is 11 °C and the minimum is 8 °C with rainfall of 44 mm. The main characteristics of the soil of the experimental site in the Kuban are the following: humus content- 6%; rNsolsv.4.5; hydrolytic acidity - 9.8 mg-eq/100 g; easily hydrolysable nitrogen - 2.1 mg/100 g; the content of mobile phosphorus and exchangeable potassium is -3.1 and 17.8 mg/100g, respectively. Seed traits are essential quantitative variables to assess seed quality and are also indicators of crop success. Hypothesis 1: What are the results of the components of yield of the local variety?. Hypothesis 2: how much varies on the outcome of the components of the yields of the 4 varieties to be introduced?

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The objectives of the study were Productivity and yield components responses the 5 quinoa varieties "Kancolla", "Amarilla marangani", "Negra collana", "Altiplano". "Seva". The introduced varieties come from the South of Puno of the Inia Institute of Peru and comprise part of the scientific study of this article, in order to improve the varieties and exchange the varieties to adverse climates, as Puno presents in times of Frost. The Productivity and yield components are: Plant panicle per m2. Weight of 1000 seeds, (g) . Yield per plant, (g). Vegetative cycle, (days). Panicle size (cm). Panicle maturation, (days). The experimental design consists of 4 introduced varieties and a local variety, with 3 blocks and 3 repetitions to create a total of 36 experimental units. Samples were collected from 12 plants for each experimental unit. The data obtained were subjected to statistical analysis using analysis of variation (ANOVA) The comparison of mean values with the statistical box model was also used (graph) and Duncan's Multiple Range with software: Statistical Package S.A.S. (Statistical Analysis System) trial version. Critical differences were worked out using LSD at 5% level of significance in order to determine the statistical difference between treatments. Sowing was carried out with a distance between the rows of 80 cm and 60 cm between the plants. The number of seeds was added to the sample: 10 kg / ha. from 5 to 8 seeds per stroke; covering it to a depth of 3 to 5 cm from soil moisture; with rain watering.

Result

The results show statistical differences between the treatments, where: Variety 2, "Seva", with an agronomic yield of 70 g. and Variety 5, "Altiplano" with an agronomic yield of 90 g. The results of agronomic yield for the late varieties are: the variety "Kancolle" of 20.5 g in the variety "Amarilla marangani" 13.3 (g) in the variety "Negra collana" 17.4 (g) The main cause presentation of fungi in the panicula, causing low yields. The plant panicle per m2 were evaluated: the varieties showed "Amarilla marangani" lateral panicles. The "Negra collana" varieties showed to have several panicles for being shrubby. The largest number of m2 panicles was "Altiplano" ,"Seva", "Kancolla" (Table 1). In the variety "Amarilla marangani" 13.3 (g) in the variety "Black collana" 17.4 (g) The main cause presentation of fungal problems in the panicula, causing loss of Amidon in the grain. The highest number of panicles per m2 were: "Altiplano", "Seva", "Kancolla" The three varieties with a number of 20 panicles per m2 (Table 1). The variety "Amarilla marangani" showed large lateral panicles. The variety "Negra collana" showed several panicles for being shrubby. The agronomic yield component of weight of 1000 seeds. A significant difference was observed between the selection of the varieties "Altiplano" at 3.7 (g) "Negra Collana " and 2.9 (g) and the local variety "Seva". 3.1 (g) (Table 1). 12 samples of randomly selected panicles were taken for each variety. The results showed that there was variation of agronomic characters between the length of the panicle and the yield. Which may explain the good yield per plant related to the size of the panicle. example: the altiplano variety with the length of the panicle is 40 cm and a yield of 90 grams of plant-, compared to the local variety "Seva" its panicle length is 25 cm and its yield of 70 grams plant. This agronomic component of the commercial maturity of the panicle is when the cultivated plant reaches the proper drying free of moisture, without green leaves and not green grains, It is important in the harvesting of large hectares. Green panicles make it impossible for the engines to work on the combine and field work is stopped by this factor, therefore: Commercial maturity is achieved when the panicle has a large percentage of starch-formed grains, and they dry quickly. The selection of productive panicles is a work of plant selection.

Table 1: The Productivity and yield components of the 5 varieties of quinoa (Chenopodium quinoa Willd). six agronomic morpho parameters were evaluated Plant panicle per m2. Weight of 1000 seeds, (g) . Yield per plant, (g). Vegetative cycle, (days). Panicle size (cm). Panicle maturation, (days).

Name of the variety	Yield per plant, (g)	Panicle. per m2	Weight of 1000 seeds, (g)	Panicle Size (cm)	Panicle maturation, Drying time (day)	Vegetative period, (days)
1"Kancolla"	20,5	20	2,7	25 cm	40	160 days
2"Seva"	65,83 -70,0	20	3.1	35 cm	7	120 days
3"Amarilla marangani"	13,3	10	2,7	40 cm	50	170 days
4"Negra collana"	17,4	7	2,9	30 cm	10	160 days
5"Altiplano"	90	20	3.7	40 cm	20	130 days

Quinoa in its vegetative cycle is an important variety to finish in the adaptation to the climate. The result shows that the variety "Kancolle" reached its physiological modules days "Amarilla marangani" 170 days and "Negra collana" 160 days expressing phenotypically as late varieties. and the 130-day "Altiplano" variety is an early variety and finally the local variety "Seva" which is a standard with physiological maturity of 120 days of physiological maturity. *Note: (Samples collected 60 plants) were

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evaluated: 5 varieties and 12 (samples) plants per variety, with 3 blocks or repetitions. Critical differences were worked out using LSD at 5%level of significance in order to determine the statistical difference between treatments the results show: with the best grain yield per plant. Variety 2, "Seva" received a harvest of 70 g. and Variety 5, received a harvest of 90 g. "Altiplano". Quantitative inheritance: Allows to study the quantitative characters that present their average and level of variance (phenotypic variation). Many genes are involved in quantitative characters. (genetic poly). Example: The size of the panicle. it has a mean and a variance level. It is a characteristic controlled by several genes. In the Figure 1 it is shown that the Altiplano variety with an average of good yield 90 grams and presents variance. therefore, its performance is diverse and it is expressing itself to the new environment. Quantitative inheritance: It allows to study the quantitative characteristics of productivity, its mean and level of variance (phenotypic variation). For example, the agricultural yield. It has a mean and a variance level. The yield is controlled by several and diverse genes that one variety possesses and the other if it possesses for example: number of panicles, panicle length, greater weight of 1000 grains, optimal grains for harvest (Figure 1). The 5 varieties the quantitative characters have a mean and a variance as shown in Figure 1.Where: The 1st quartile (Q1) of 25% of the data is less than or equal to this value. The 2nd quartile (Q2) Median. 50% of the data is less than or equal to this value. The 3rd quartile (Q3) 75% of the data is less than or equal to this value. The interquartile range is the distance between the first 1st quarter and the 3rd quartile (Q3-Q1); thus, it covers the central 50% of the data. The phenotype variance depends on the genotypic variance and the environmental variance and the interaction between the two.

Conclusion

Were concluded that the seed traits and initial quality among the selected varieties are strongly influenced by the performance components of each variety. The yield component the number per plants per hectare is defined by the farmer at the time of planting by the number of seeds per square meter. The yield component of number of panicles is defined by the proliferation of the plant, so it is important to count how many panicles per plant we have at the time of harvesting. The yield component the number of grains per panicle and this depends on the structure of the panicle, the physiological maturity of each grain and correlated with the genotype of each variety. The component of the grain weight depends on the agronomic management of both fertilization, irrigation, pest control and diseases. To carry out the integral comprehensive driving of the performance components it is important to know the critical time of grain formation and maintain its quality. Example: The white grain is important in marketing and fungal diseases stain the dark with their spores. The development of starch formation slows down, If temperatures are low enough, damage to viable seed formation can occur. The right plant densities with an agricultural planter can be a key and important factor to increase the productivity of quinoa. The density of plants and the spacing between furrows, can directly affect the yield of the crop, for this reason the same distancing was applied in all varieties. The altitude and the amount of oxygen are correlated, and lower altitude the greater the amount of oxygen and this is important in the photosynthesis of the plant. therefore, it is likely that the selected cultivars will adapt to a short vegetative cycle. Based on grain yield is an important technology generation and genetic improvement. The more genes controlling a character, the more distribution classes formed and the greater variance among genotypes. The phenotype variance depends on the genotypic variance and the environmental variance and the interaction between the two. Based on grain yield is an important strategy in genetic improvement and technology generation. So it allows you to form pure lines. Said pure lines in the second generation contain the heritability of a new genotype active in the face of an adverse environment could be employed for improvement crop. the adaptation : The phenotype, depends on the genotype and the environment. when there are crosses, we must first the plant adapt to the first generation to have a homogeneous population and then produce varietal lines. These results are useful to inform seed management, exchange, utilization, and have a high potential in breeding projects and require further research attention.

References

1. Fagandini RF, Bazile D, Drucker AG, Tapia M, Chura E (2021) Geographical distribution of quinoa crop wild relatives in the Peruvian Andes: A participatory mapping initiative. Environment Development and Sustainability 23: 6337-6358.
2. Miller MJ, Kendall I, Capriles JM, Bruno MC, Evershed RP (2021) Quinoa, potatoes, and llamas fueled emergent social complexity in the Lake Titicaca Basin of the Andes, Proceedings of the National Academy of Sciences 118: e2113395118.
3. Fan Zhu (2023) Quinoa Chemistry and technology. Academic Press is an imprint of Elsevier London, United Kingdom.
4. Bakhtavar MA, Afzal I (2020) Climate smart dry chain technology for safe storage of quinoa seeds. Scientific Reports 10: 12554.
5. Kibar H, Temizel KE (2021) Kinetics of temperature and time effects on bioactive compounds and technological properties of quinoa varieties during storage. Journal of Food Processing and Preservation 45: e15297.
6. Arslan TS (2021) Moisture sorption isotherm and thermodynamic analysis of quinoa grains. Heat and Mass Transfer 57: 543-550.
7. Shah SS, Shi L, Li Z, Ren G, Zhou B, et al. (2020) Yield, agronomic and forage quality traits of different quinoa (*Chenopodium quinoa Willd.*) genotypes in Northeast China. Agronomy 10: 1908.
8. Yang XS, Qin PY, Guo HM, Ren GX (2019) Quinoa industry development in China. Ciencia e Investigación Agraria 46: 208-219.
9. Angeli V, Miguel SP, Crispim MD, Khan MW, Hamar A, et al. (2020) Quinoa (*Chenopodium quinoa Willd.*): An overview of the potentials of the "golden grain" and socio-economic and environmental aspects of its cultivation and marketization. Foods 9(2): 216.

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