Nutritional properties of quinoa (Chenopodium quinoa Willd.) and its effects on cardiometabolic risk factors and gut microbiota

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Nutritional properties of quinoa (Chenopodium quinoa Willd.) and its effects on cardiometabolic risk factors and gut microbiota
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Abstract:

Across the globe, cardiovascular disease (CVD) is the leading cause of cause of death, including in China, where mortality from CVD has increased rapidly in the past few decades. There is a growing body of epidemiological studies to suggest that diets rich in whole grains are linked to a lower risk of CVD and mortality, with similar results found across diverse populations. Quinoa, as an example of a pseudo-cereal, is included in the ‘’whole grain’’ class in terms of nutritional value, suggesting that quinoa is a possible alternative to common cereals, such as wheat, rice and corn. In this study, a total of thirteen commonly used commercial quinoa accessions and nine buckwheat accessions were sourced from various regions, including Peru, Ecuador, Bolivia, USA, UK, Netherlands and China. In order to select the quinoa accession with ‘optimal’ nutrition for use in the future human intervention study, chemical analysis of these thirteen quinoa accessions was conducted including phytochemical and dietary fibre content. There was considerable variation in the proximate composition but on average the quinoa seed samples had a higher content of protein, fat, fibre, phenolics and apparent antioxidant capacity, as well as well-balance amino-acids compared with other cereals. For the buckwheat accessions, only phenolic content and antioxidant activity were analysed, which also showed a wide range. The effects of quinoa on humans has rarely been investigated with just three small interventions published, with inconsistent results; moreover, their possible effects on gut microbiota are totally unknown. An exploratory study was carried out to compare the effects of a quinoa-enriched bread as part of the usual diet with refined wheat bread on CVD risk markers and the gut microbiota. Thirty healthy obese men (35-70 years, BMI>25kg/m2) completed a 4-week cross-over intervention, separated by a washout period of at least 4 weeks. The intervention diet was 1 quinoa roll/day weighing approximately 162 g that included 20g quinoa seed flour and 80 g refined wheat flour compared with an equivalent sized 100% refined wheat roll. Fasting blood sample, 24h urine and gut microbiota samples were collected at the beginning and end of each

intervention period, as well as dried blood spots after standard breakfast (100 g quinoa or refined roll with 10 g strawberry jam). After 4 weeks of quinoa roll consumption, there was a significant decrease in glucose by 4.5% and LDL cholesterol by 5.7% compared with the corresponding baseline, but the changes between the two treatments did not reach significance level. Moreover, anthropometric variables, other blood variables and plasma antioxidant capacity also did not significantly differ between two treatments. Continuous glucose monitoring was applied for 4 days before and after sampling at the end of each intervention period. The AUC for glucose over the four days at the end of the quinoa treatment period was borderline significantly lower than the following four days when quinoa consumption 12 ceased ($p=0.054$). As for the postprandial glucose changes, although some important differences in glucose responses between quinoa and refined wheat rolls breakfast, such as significantly different AUC values over 4 hours, were not observed in capillary blood samples, the glucose response curves were relatively similar; there was a more rapid fall approximately after 60 mins after the quinoa roll breakfast. Although there were some changes in the relative abundance of gut microbiota within treatment like Firmicutes and Bacteroidetes, no significantly differences in diversity measures (alpha and beta) and relative abundance of gut microbiota were observed between two treatments. The presence of many 'trend' results, such as glucose, insulin and LDL cholesterol values, in the present study indicates that significant results might have been obtained with prolonged duration, higher dose and larger numbers of subjects. In conclusion, a specific quinoa diet improves cardiometabolic risk-associated biomarkers and gut microbiota in a healthy cohort, indicating potential value as a healthy gluten-free alternative to common cereals.

Reference

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