Background:
Mashua (Tropaeolum tuberosum), a close relative of nasturtium, produces edible tubers consumed by people in the Andean highlands from Colombia to northwest Argentina (Fig. 1). Archaeological evidence dates mashua's cultivation to 650 AD. As a subsistence crop, mashua tubers mainly fill the staple starch role, similar to potato. However, it has a peppery or cabbage-like flavor, especially when raw, that is ripe for culinary exploration. Mashua has the potential to be a unique addition to raw dishes, pickles, or ferments. The leaves also have a peppery flavor, especially when like flavor, especially when

Mashua is currently underutilized and understudied as a food crop. It could be a great candidate for organic agriculture due to low fertilizer requirements, pest and disease tolerance, high productivity, and its medicinal effects. As cultivation of mashua declines in its traditional region, expanding its scope is also an opportunity to preserve its biodiversity. The coastal Pacific Northwest has similar temperatures and rainfall to mashua’s native region, making the area a promising location for its cultivation.

Introduction:
Agriculture in the U.S. focuses on a relatively small number of crops compared to the enormous array of edible plants in the world. In a world with a changing climate, growing a diversity of food crops provides more security, stability and flexibility in growing food for a swelling population.

Materials & Methods:
Mashua is cultivated from tubers rather than seeds. Seven clonal varieties of mashua were chosen to represent a range of characteristics including flavor (from sweet to cabbage-like), color (white with purple stripes, yellow, and orange-red), tuber yield, and origin (known heirlooms from the Andes to recent cultivars in the U.S.). Fig. 4 shows a range of tuber phenotypes.

On April 20, I cut the tubers into sections with two "eyes" each, let them suberize, then planted them in 4-inch pots 2-3 inches deep in OMRI certified organic potting soil mixed with compost (Fig. 5). Once the plants were established, we transplanted them to an organically managed field at the Lewis Brown Farm for the variety trial using a randomized block design with two plants per plot and three reps (Fig. 6). Plants are spaced 30 inches apart within rows and watered with drip irrigation. Throughout the growing season, data will be taken on high and low temperatures, day-length and rainfall. I am currently evaluating plant characteristics including date of flowering, date of tuber production, and presence of any pests and diseases.

Objectives:
To evaluate the performance of seven clonal cultivars of mashua in grown in the Willamette Valley. Specifically, we are looking at the adaptations and productivity of various mashua cultivars in this growing environment. Secondly, we will investigate the culinary quality and potential of the tubers.

Cultivars & Sources:
Cultivariable (Moclips, WA)
- Copalis
- Hoh
- Lima
- Dabop

Peace Seedlings (Corvallis, OR)
- Chilean Red
- Pilleria
- Puca Añu

Potential Nutritional Benefits:
- High vitamin C content
- High anthocyanin (purple tubers)
- High Beta-carotene (yellow tubers)
- Low sodium

Medicinal Uses:
In the Andes, it is used as treatment for tonsillitis, dengue and malaria fever, skin ailments, to induce menstruation and as an anaphrodisiac. Compounds found in mashua have been shown to prevent cardiovascular illness, cancer, and other neurodegenerative illnesses as well as benign prostatic hyperplasia.

Mashua contains glucosinolates—compounds that form mustard oils. These are also found in cruciferous vegetables like broccoli, horseradish, and brussels sprouts (Brassicaceae family). Glucosinolates are the precursors to isothiocyanates which have antibacterial, insecticidal, nematocidal and diuretic properties, which substantiates mashua’s extensive use in Andean folk medicine. Glucoraphanin is one type that is converted to sulforaphane when the tissue is macerated. This compound is a strong anticarcinogen and acts by upregulating the phase II enzyme system in the liver, which is responsible for removing toxins and carcinogens.

Ongoing Work:
This project will continue through Spring 2022 through the Continuing Undergraduate Researchers Program. At harvest, I will find the total tuber weight and number per plant and record characteristics of tuber color and shape. I will test the tubers for soluble solids content (brix) and total solids (dry weight). We will characterize tubers for total glucosinolates using the spectrophotometric method developed by Mawlong et al. (2017). We will evaluate tubers for raw taste and flavor, using rating scales for pungency and sweetness.

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References:

Table 1. Comparison of nutritional content.1, 2