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RESEARCH

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Not all purslane (*Portulaca oleracea*) is equal: varietal differences under greenhouse conditions

Roland Ebel[1*] and Josephine Walterskirchen[2]

Abstract

Purslane (*Portulaca oleracea* L.) is a cosmopolitan annual herb with succulent foliage, widely consumed raw, cooked or pickled, and distinguished by its high α-linolenic acid (ALA) content, higher than that of common leafy greens. Purslane also provides linoleic acid (LA), diverse minerals, as well as vitamins A, C and E, underscoring its nutritional potential. Although cultivated commercially in parts of Asia, Europe and Mexico, purslane is often treated as a weed among conventional farmers. In temperate and cold climates, greenhouse production of purslane is essential to ensure year-round supply, yet research on promising varieties has been limited. We evaluated five commercially available purslane varieties ('Red Gruner Microgreen Seed', 'Green Purslane', 'Scarlet', 'French Green Leaf' and 'Heirloom Verdolaga') for growth, biomass and fatty acid profiles under greenhouse conditions. In addition to dry biomass, we measured plant height and diameter, which were integrated into a z-score growth index to assess temporal growth dynamics. The fatty acid profile of each variety was quantified using the Folch method. Biomass differed among varieties. 'Green Purslane' produced the highest yield (0.68 g plant^{-1}), exceeding 'Scarlet,' 'Heirloom Verdolaga' and 'Red Gruner,' while 'French Green' showed intermediate yield. Growth trajectories were fastest for 'French Green' and 'Red Gruner'. Although statistical analysis of this parameter was not performed, fatty acid composition of 'Green' showed a trend towards superiority, with 421 mg kg^{-1} LA, an exceptional 1625 mg kg^{-1} ALA, the lowest LA/ALA ratio of 0.26, and the highest polyunsaturated fatty acid proportion (73%), exceeding published ranges. We identified 'Green' as a strong candidate for indoor purslane production.

Significance of the study

1. What is already known on this subject?
   Our study addressed the research gap of purslane variety trials in greenhouse conditions. The availability of commercially bred purslane varieties is scarce; and the majority of existing studies that discuss purslane varieties either has an ethnobotanical background or deals with management or growth environments, such as saline conditions, while variety comparisons are only a secondary aspect.
2. What are the new findings?
   Our study was limited to one single production cycle and by the small number of commercially grown purslane varieties accessible in the US which led to only five examined cultivars, which we examined regarding their yield. The fatty acid composition of each cultivar was measured from a composite sample. Based on this input, we identified the variety 'Green' as a promising material for indoor production, due to a satisfactory yield and a promising fatty acid profile by trend.

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3. What are the expected impacts on horticulture?
The latter is relevant as health motivations, specifically omega-3 fatty acid content, may be central for a potentially growing customer base of the nutritious and tasty leafy green, which, in turn, could increase the number of commercial producers. Research comparing different seeding densities, fertilization managements, and light and watering regimes, and their impact on different purslane varieties could further improve purslane variety development and overall commercial production.

Keywords: purslane, greenhouse, fatty acid profile, leafy green, edible weed, Verdolaga

Introduction

Common purslane (*Portulaca oleracea* L.), hereof purslane, is a herbaceous annual in the *Portulacaceae* family (Lim and Quah, 2007) with succulent leaves (Fontana *et al*., 2006) and succulent, branched, reddish, often prostrate stems (Akbar, 2020). The centre of origin of the cosmopolitan species is uncertain, and Eurasia (Amirul Alam *et al*., 2014) as well as Mexico (Simopoulos *et al*., 1995) have been suggested. While Old World origin is discussed more frequently (Kumar *et al*., 2021), the species already existed in the United States pre-colonization (Palaniswamy *et al*., 2000). Purslane grows wild in cold to warm climates, including most parts of the United States (Zhou *et al*., 2015). It generally completes its life cycle within 60–75 days and germinates 7–10 days after sowing (Amirul Alam *et al*., 2014). Purslane is a C_4 plant able to shift to CAM-like photosynthesis when subjected to water stress (Ferrari *et al*., 2020). It can grow on diverse substrates, including nutrient-poor, saline, hard and very dry soils (Teixeira and Carvalho, 2009; Nance, 2023) but requires direct sunlight and warm temperatures around 25°C (Yang *et al*., 2012; Carrascosa *et al*., 2023).

While mostly considered a weed in conventional agriculture (Omara-Alwala *et al*., 1991), purslane is produced commercially in Eastern Asia, the Middle East, the Mediterranean region of Europe, Central Europe and Mexico (Gonnella *et al*., 2010; Egea-Gilabert *et al*., 2014; Srivastava *et al*., 2023). Whether gathered wild or grown as a leafy green crop, the entire plant is edible and (especially stems and leaves) can be used raw, cooked or pickled (Omara-Alwala *et al*., 1991) in soups, stews and salads (Menalled and Ebel, 2025). Purslane has a mucilaginous quality that helps thicken stews (Amirul Alam *et al*., 2014).

Purslane is appreciated as a traditional medicine in diverse cultures. Chinese folklore describes purslane as "vegetable for long life" (Zhou *et al*., 2015). It is a richer source of 18:3 ω3 (ALA, omega-3) fatty acids than any other leafy green (Simopoulos and Salem, 1986; Ezekwe *et al*., 1999). The content of 18:2 ω6 (LA, omega-6) fatty acid is also elevated (Simopoulos, 2020). Overall, polyunsaturated fatty acids in purslane comprise 49–56% of total fatty acids (Petropoulos *et al*., 2015), which makes this species highly beneficial for vegan and vegetarian diets, generally lacking essential fatty acids (Kumar *et al*., 2022). While LA is higher in stems, most ALA is found in leaves (Petropoulos *et al*., 2019). Purslane also has an omega-6/omega-3 ratio convenient for human nutrition (Oliveira *et al*., 2009).

Genetics, climate and management affect the amount of LA and ALA in purslane. Harvest date plays a crucial role in nutrient composition with total fatty acid content constantly increasing in leaves, but peaking at 49 days after sowing (DAS) in stems (Omara-Alwala *et al*., 1991). Mild cold stress can increase ALA content (Saffaryazdi *et al*., 2020), and the accumulation of both ALA and LA decreases in saline conditions (Anastácio and Carvalho, 2013). Nitrogen affects purslane's fatty acid composition as high uptake decreases, for example, palmitic acid and increases ALA content (Fontana *et al*., 2006). Although nitrogen can increase the omega-6/omega-3 ratio, it reduces the oxalate content (Fontana *et al*., 2006).

Purslane is also rich in diverse minerals, vitamins A, C and E, as well as flavonoids (Wenzel *et al*., 1990; Zhu *et al*., 2010) but its phytochemical composition is strongly influenced by the harvesting stage (Mohamed and Hussein, 1994; Oliveira *et al*., 2009). Like most leafy greens, purslane has an elevated oxalate content (Petropoulos *et al*., 2019), which is safe for daily consumption (Yen *et al*., 2001) but can be concerning for individuals susceptible to kidney stones (Salgado *et al*., 2023). Purslane has a wide range of pharmacological effects, including antidiabetic, antiviral and antitumoral activities, as well as decreasing the levels of triglycerides and cholesterol in blood (El-Sayed, 2011; Zidan *et al*., 2014; Montoya-García *et al*., 2018). Purslane is also an ornamental plant (Ashrafi *et al*., 2015) and has been discussed as a cover crop and phytoremediation source (Carrascosa *et al*., 2023).

More than three decades ago, Simopoulos *et al*. (1992) suggested purslane as a crop worth expanding from niche to larger-scale production. While this claim has been reiterated ever since (Carrascosa *et al*., 2023), its adoption in the United States has not materialized. Globally, most purslane production occurs outdoors, but in temperate climates, greenhouse production can shorten the growth cycle and reduce seasonality, a potential strategy to increase its adoption by US markets (Simopoulos and Salem, 1986; Carrascosa *et al*., 2023).

Although numerous studies evaluated morphological, physiological, ethnobotanical, nutritional and medicinal aspects of purslane, research on the genetic diversity and existing varieties is rare (Amirul Alam *et al*., 2014). While several bred varieties of purslane exist (Omara-Alwala *et al*., 1991), most studies focus on wild phenotypes (Liu *et al*., 2000) or ornamental varieties (Lim and Quah, 2007). Ren *et al*. (2011) reported substantial drought tolerance and genetic diversity among ten globally sourced wild purslane accessions. Siriamornpun and Suttajit (2010) demonstrated morpho-physiological and nutritional differentiation among eight accessions, particularly in crude protein, lipid and essential fatty acid composition. Mulry *et al*. (2015) found that the variety 'T-16' uses different multi-trait strategies to cope with salt stress than a wild type. Borsai *et al*. (2020) observed that salt stress significantly increases total phenolics and flavonoids in purslane, with a more limited response in the 'Toucan Scarlet Shades' variety than in wild phenotypes. Other varieties discussed in research include 'Green' (Uddin *et al*., 2012), 'Golden Gerber', 'Garden' (Cros *et al*., 2006), 'Golden' (Cros *et al*., 2006; Uddin *et al*., 2012) and ornamental cultivars (Amirul Alam *et al*., 2014). Overall, purslane varieties differ in their yield and chemical compositions, specifically, fatty and oxalic acid content (Petropoulos *et al*., 2015).

At Montana State University (MSU), where different programmes have collaborated on identifying promising new leafy green species, including so-called 'edible weeds', we explored the yield performance and basic nutritional properties of five purslane varieties grown in the greenhouse. Our goal was to provide basic and applied information that could foster the commercial adoption of purslane among diversified, small-scale farmers.

Methods

RESEARCH DESIGN

We assessed dry biomass, height and diameter growth and fatty acid content of five purslane varieties grown in greenhouse conditions. Plants were grown from December 2024 to January 2025 on a 1.83 m × 7.32 m greenhouse bench. Seeds were sown individually using fine-tipped forceps into 1.3 cm deep holes in heavy-duty 1020 trays (25.4 × 50.8 × 6.5 cm). We used a substrate consisting of Canadian sphagnum peat moss, perlite, vermiculite, starter nutrient charge, wetting agent and dolomitic lime. Irrigation water was supplied from the municipal water system in Bozeman, MT. Trays were manually irrigated with a watering can, applying 26 ml plant^{-1} day^{-1} from 3 DAS until harvest. Throughout the experiment, the greenhouse was kept at 22°C during the day and 18°C at night with potential temporal deviations of up to 1.5°C (Montana State University, 2025; Montana State University, 2025). Illumination was provided by a 1000 W metal halide lamp, operated on a 16 h photoperiod (05:00–21:00), delivering 100 µmol m^{-2} s^{-1} of photosynthetically active radiation at canopy level. In addition to the nutrients present in the substrate (35 mg l^{-1} NO_3^-, 14 mg l^{-1} NH_4^+, 42 mg l^{-1} PO_4^{3-} and 113 mg l^{-1} K^+), from 3 to 49 DAS, plants received a total of 97.5 mg plant^{-1} of each N, P and K through 14 applications (twice a week) of GrowMore, a water-soluble NPK fertilizer (Grow More Inc., Gardena, CA, USA). No pesticides were used for pathogen control.

Our experiment consisted of a fully randomized block design with three replications per treatment (corresponding to variety), where each replication comprised one purslane variety seeded in a separate tray with 60 plants per tray (planting density of 0.0545 seeds cm^{-2}). We selected the purslane varieties based on their commercial availability in the United States, which is limited. We compared the following purslane varieties:

- 'Red Gruner Microgreen Seed' (hereof 'Red Gruner,' Johnny's Selected Seeds Company, Fairfield, ME) that has elevated omega-3 content and is adapted to varying plant densities and light conditions (Ramu, 2012);
- 'Green Purslane' (hereof 'Green,' Southern Seeds, Frisco, TX), a fast-growing variety from the United States (Seed Therapy, 2025);
- 'Scarlet' (Outside Pride, Independence, OR), a variety also used as an ornamental (OutsidePride, 2025);
- 'French Green Leaf' (hereof 'French Green,' Adaptive Seeds, Sweet Home, OR), an organic variety with dark green leaves and succulent stems that resembles wild purslane but grows upright (Adaptive Seeds, 2025); and
- 'Heirloom Verdolaga' (Survival Garden, Rigby, ID), promoted as a fast-growing variety that tolerates poor soils and dry hot weather (Survival Garden, 2025).

This experiment was part of a series of studies on purslane conducted at MSU. In a previous experiment, these five varieties were selected out of eight analysed cultivars due to their elevated germination rate and early growth performance, while other commercially available varieties, 'Toucan Scarlet Shades,' 'Golden' and 'Goldberg' underperformed and were discarded. For each variety, we measured dry biomass and fatty acid profile after harvest 52 DAS. Harvest timing was selected to maximize total lipid content, especially in stems (Omara-Alwala *et al.*, 1991).

SAMPLING PROCEDURES

For dry biomass determination, 10 representative plants per replication (tray) were randomly selected and harvested, and their above-ground biomass (stems and leaves) was combined into a single composite sample. Samples were dried at 60°C for 48 h to constant weight and weighed to the nearest 0.01 g; biomass was then expressed on a per-plant basis by dividing total dry weight by 10. Measurements of living plants were conducted every 3 days from 10 to 46 DAS, on a total of 13 occasions. Diameter (mm) was measured as the span of the apical meristem leaves using a digital calliper, and plant height (mm) was recorded from the substrate surface to the apical bud. Six plants per replication were randomly selected and measurements per replication were averaged for each sample date.

For fatty acid profiling, the above-ground tissue of three plants per replication (nine per treatment) was harvested, shredded and pooled to obtain one composite sample per treatment. Then, samples were immediately deep frozen. Fatty acid analysis was performed externally by Creative Proteomics (Shirley, NY, USA) using their standard GC-FID protocol: samples were extracted using a modified Folch method (Taha *et al.*, 2012), where they were weighed into screw-cap glass vials containing tritricosanoin (tri-C23:0 TG) as internal standard (NuCheck Prep, Elysian, MN, USA), homogenized, and lipids extracted. A portion of the organic layer was transferred to a screw-cap glass vial and dried in a speed vac. After samples were dried, a boron trifluoride–methanol–toluene reagent (35:30:35, v/v/v; Sigma-Aldrich, St. Louis, MO, USA) was added for transesterification, followed by heating at 100°C for 45 min. Once cooled, hexane and water were added to separate phases, and an aliquot of the hexane layer containing fatty acid methyl esters (FAMEs) was transferred to GC vials. Samples were analysed on a GC2010 gas chromatograph (Shimadzu, Columbia, MD) with a Supelco SP2560 column (Supelco, Bellefonte, PA). Fatty acids were identified and quantified using a certified standard mixture (GLC OQ-A, NuCheck Prep, Elysian, MN) to generate individual fatty acid calibration curves (Creative Proteomics, 2025). Individual fatty acids were quantified for each sample and reported as absolute concentrations (mg kg^{-1}) and relative proportions (% of total fatty acids).

DATA ANALYSIS

All analyses were performed in SPSS 20 (IBM Corp., Armonk, NY). For dry biomass, we conducted a two-factor ANOVA to assess treatment effects using the clustered observations of 10 plants per replication (Backhaus *et al.*, 2025) with variety and replication as fixed factors, treating the tray as the experimental unit (n = 3 per variety). Tukey's Honest significant difference (HSD) test was used for post hoc pairwise comparisons at $\alpha = 0.05$ (Nanda *et al.*, 2021). Plant height and diameter were integrated into a single z-score growth index to enable sequential assessment of variety performance through a robust indicator of growth, thereby minimizing scale-related bias, which was relevant in our study as we compared prostrate and upright-growing varieties, enabling for treatment comparisons over time (Jolliffe *et al*., 1982; Williams *et al*., 2025). These mean values were standardized as z-scores across all observations (treatments × dates × replications) to place both traits on a common scale (Abdi, 2007; Virk *et al*., 2019). The mean of the two standardized values was used as a dimensionless index, which was visualized in a line chart displaying treatment performance across sampling dates. The fatty acid profile is expressed as mg kg^{-1} per fresh matter and as a percentage of total fatty acids in a summary table without statistical testing, since one composite sample per treatment was obtained by pooling above-ground biomass from all replicates, and this composite sample was analysed once by gas chromatography with flame ionization detection per treatment.

CONTEXT OF THE RESEARCH

This experiment forms part of a broader series of MSU research on greenhouse production of purslane, aimed at its management, varietal diversity and nutritional potential. The study was constrained by the limited availability of commercially grown purslane varieties, which restricted the range of germplasm that could be evaluated. Additionally, funding for this experiment was modest, which imposed limitations on both the experimental timeline and the number of parameters measured.

Results

DRY BIOMASS

Biomass differed among varieties ($F_{4,8}$ = 4.88, p = 0.027), while neither replication (p = 0.169) nor the variety×replication interaction (p = 0.866) impacted harvested biomass. 'Green' produced greater dry biomass than 'Scarlet', 'Heirloom Verdolaga' and 'Red Gruner', whereas 'French Green' did not differ from any of the other varieties (Table 1, Fig. 1).

TEMPORAL GROWTH

The z-score–based growth index used to assess temporal growth is intended as an exploratory, descriptive metric rather than an inferential analysis. Accordingly, 'French Green' and 'Red Gruner' followed the most rapid growth trajectories throughout the measurement period (Fig. 2). 'Green' and 'Heirloom Verdolaga' displayed comparatively slower early growth, with 'Heirloom Verdolaga' approaching the levels of 'French Green' and 'Red Gruner' between 43 and 46 DAS. 'Scarlet' exhibited the slowest growth trajectory until 43 DAS but converged with 'Green' at the final assessment.

Table 1. Biomass (mean, standard deviation and coefficient of variation) across five purslane varieties.

Variety	Mean dry biomass (g plant^{-1})	Standard Variation	Coefficient of Variation
Green	0.68	0.17	25.48
French Green	0.53	0.05	9.59
Red Gruner	0.40	0.03	8.54
Heirloom Verdolaga	0.46	0.05	11.54
Scarlet	0.49	0.06	13.14

FATTY ACID PROFILE

The fatty acid profile comprised 24 fatty acids across the five purslane varieties. Regarding nutritionally important polyunsaturated fatty acids, the 'Green' variety contained 421 mg kg^{-1} LA and 1625 mg kg^{-1} ALA (fresh weight basis) or 162.5 mg per 100 g fresh product, corresponding to 38% and 28% higher concentrations, respectively, than the second-highest variety for the respective fatty acid (Table 2). 'Scarlet' had the highest LA/ALA ratio of 0.35 and the lowest content of polyunsaturated fatty acids (PUFAs) out of total fatty acids (56.9%). 'Green' and Red Gruner showed the lowest LA/ALA ratio of 0.26 and 'Green' was also the highest for its PUFA content (72.7%).

Discussion

As purslane is being considered as a leafy green in the United States (Petropoulos *et al*., 2019) and beyond (Corrado *et al*., 2021), assessing its intraspecific diversity becomes relevant, especially for traits valued by producers and consumers such as yield, quality and nutritional compounds. In different parts of the world, purslane most commonly grows spontaneously as a crop weed and is also gathered as a wild food plant (Ebel *et al*., 2024), but cultivars exist (Uddin *et al*., 2012) due to commercial production in the Mediterranean and Mexico (Cros *et al*., 2006; Carrascosa *et al*., 2023). Purslane is not a typical semi-domesticated species (that remain largely similar to their wild counterparts (Meyer *et al*., 2012)) but its bred varieties exhibit clear morphological divergence from wild types (Cros *et al*., 2006).

The genetic diversity of wild purslane genotypes has been demonstrated in diverse studies, for example, examining the response to different environmental stressors (Amirul Alam *et al*., 2014). Phenotypic plasticity is a key driver of cultivar diversification and can even enhance a species' capacity to persist under climatic change (Mulry *et al*., 2015). The substantial genetic variation within wild purslane, consequently, offers a robust, valuable gene pool for breeding programmes, for example, for developing high-yielding, omega-3–rich cultivars, with unique tastes, leaf and stem structures, growth rates or tolerance levels to abiotic and biotic stresses (Yan *et al*., 2009; Petropoulos *et al*., 2015). This potential is not yet reflected in the market. Despite an effort to obtain diverse cultivars for our experiment, we were only able to purchase eight of them, out of which three were discarded in a preliminary trial due to poor germination rates.

With a dry per-plant biomass of 0.68 g (p = 0.027), 'Green' was the highest-yielding variety in our study. Considering a seeding density of 0.0545 seeds cm^{-2} and a typical moisture content of 89.75% at 52 DAS, assuming equal proportion of leaves and stems (Petropoulos *et al*., 2019), this corresponds to approximately 3.61 kg m^{-2} fresh mass of 'Green' harvested in our study. A similar greenhouse experiment by Alu'datt *et al*. (2019) achieved 2.3–3.5 kg m^{-2} fresh purslane yield, depending on harvest cycle, under a soilless management and 3.9–6.2 kg m^{-2} with a 2 : 1 tuff-peatmoss substrate. Seeding density for this experiment was not specified, which affects comparability. A soilless experiment by Fontana *et al*. (2006) with a considerably higher seeding density of 0.31 seeds cm^{-2} and higher nitrogen fertilization obtained 2.7 kg m^{-2} fresh yield using a variety from a Spanish seedbank. Mortley *et al*. (2012) experimented with 'Golden,' one of the varieties that we did not select for our study due to deficient

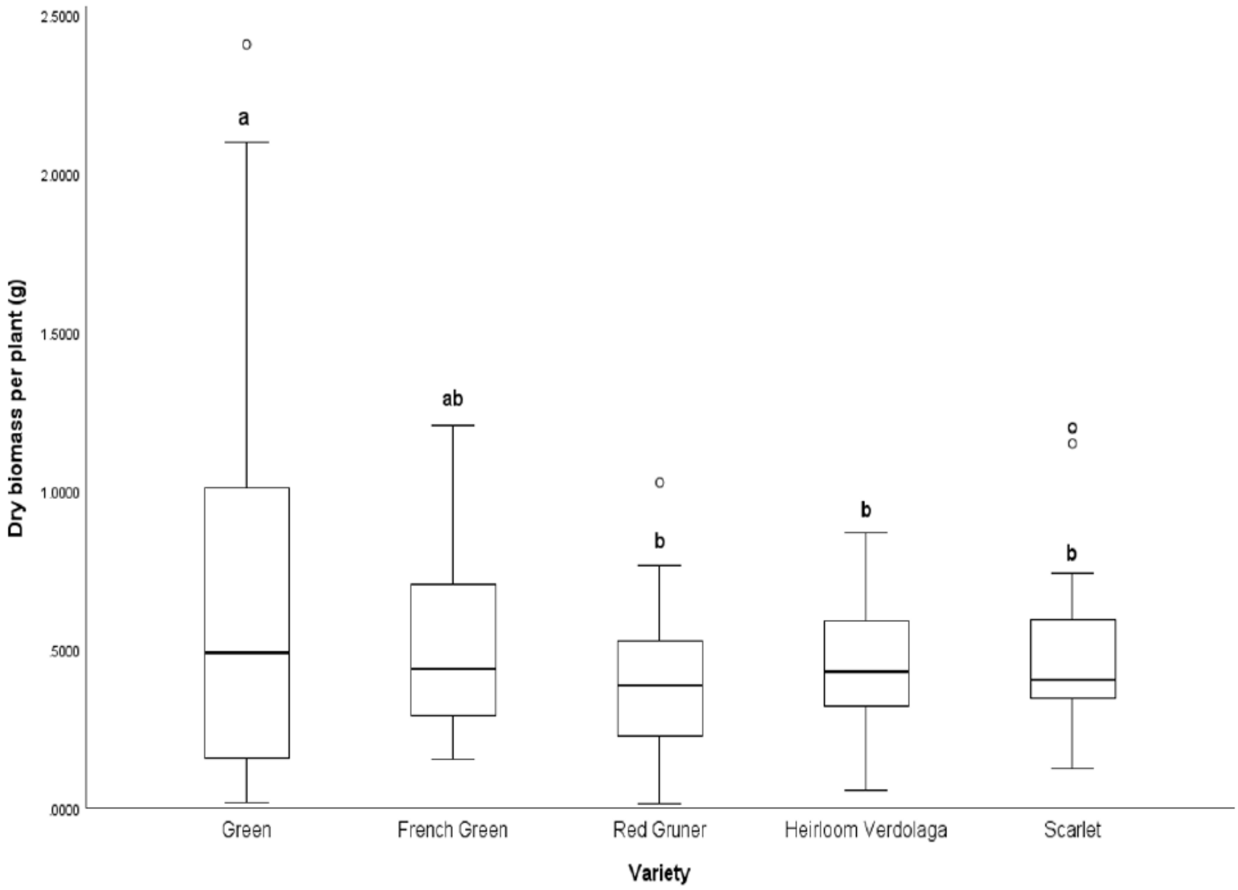

Fig. 1. Above-ground dry biomass of purslane across five varieties ($n = 3$). Boxes represent the interquartile range (25th–75th percentiles) with the median indicated by the horizontal line; whiskers (vertical lines) extend to the minimum and maximum observed values. Letters above boxes denote significant differences among varieties (Tukey's HSD, $p < 0.05$)

performance in our preliminary trial. Their comparable greenhouse study had a lower seeding density of 0.002 plants cm^{-2}, used a similar substrate, but seedlings were transplanted. Dry leaf biomass per plant (stems, which approximately contribute half of the yield mass, were not included) was 0.45 g $plant^{-1}$ 20 DAS and 2.63 g $plant^{-1}$ 40 DAS, respectively. Consequently, the yield we measured for 'Green' places this variety at the upper end of greenhouse yields reported in the literature. In contrast, the other four varieties we used in our experiment (0.40–0.53 g $plant^{-1}$) align more closely with published ranges, though differences in genetic material, substrate, fertilization and other management issues limit direct comparability. We also learned that 'French Green' and 'Red Gruner' showed the fastest vegetative growth, which underlines their potential to be used as microgreens. 'Heirloom Verdolaga' did not keep the promise of early vegetative growth, articulated by their distributors (Survival Garden, 2025) but matched the previously mentioned varieties in the days before harvesting, just as 'Green' did.

Regarding the fatty acid profile, Petropoulos *et al.* (2015) assessed five wild genotypes and one commercial variety, 'Dark Green,' and demonstrated considerable genotypic variability in purslane fatty acid composition, with a LA out of total fatty acid content ranging from 25.1% to 32.9% and ALA from 17.9% to 28.4%, respectively. The six assessed genotypes assessed by Petropoulos *et al.* (2015) yielded LA/ALA ratios of 0.88 to 1.71 and a total PUFA content of 48.6–56.1%.

The LA/ALA ratio is an essential indicator on the nutritional and health benefits of a food source: Typically, a lower ratio indicates a more health-promoting fatty acid profile, especially for reducing inflammation and supporting long-term cardiovascular and metabolic health (Simopoulos, 2002). In our study, we analysed one composite sample per variety (no statistical analysis possible). We found elevated absolute concentrations of ALA (up to 1625 mg kg^{-1} in 'Green') and a stronger dominance of ALA among all fatty acids, with ALA proportions of 41.5–57.4% and LA/ALA ratios of 0.26–0.35. Total PUFA content in all assessed varieties (57–73%) exceeds the ranges reported by Petropoulos *et al.* (2015). These results indicate that the examined varieties had favourable fatty acid profiles, exemplified by 'Green', where we measured a higher ALA content than in other leafy greens such as spinach (1292 mg kg^{-1}) or lettuce (940 mg kg^{-1}), and similar to ALA-rich watercress (1796 mg kg^{-1}) (Pereira *et al.*, 2001).

Considering that ALA should provide 0.6–1.2% of human energy intake, corresponding to roughly 1–2 g per adult and day (Trumbo *et al.*, 2002), consuming 100 g of 'Green' purslane could provide approximately 10% of recommended ALA intake for men and

Table 2. Fatty acid profile* of five purslane varieties in mg kg^{-1} fresh matter** (descriptive values from one composite sample per variety).

Fatty acid	Green	French Green	Red Gruner	Heirloom Verdolaga	Scarlet
Myristic acid (C14:0)	**20 mg kg^{-1}** (0.7%)	11 mg kg^{-1} (0.6%)	15 mg kg^{-1} (1.2%)	14 mg kg^{-1} (0.7%)	14 mg kg^{-1} (0.7%)
Palmitic acid (C16:0)	455 mg kg^{-1} (16.1%)	319 mg kg^{-1} (18.0%)	266 mg kg^{-1} (21.1%)	384 mg kg^{-1} (18.9%)	**545 mg kg^{-1}** (25.8%)
Palmitelaidic acid (C16:1n7t)	9 mg kg^{-1} (0.3%)	8 mg kg^{-1} (0.4%)	7 mg kg^{-1} (0.5%)	8 mg kg^{-1} (0.4%)	**15 mg kg^{-1}** (0.7%)
Palmitoleic acid (C16:1n7)	**6 mg kg^{-1}** (0.2%)	2 mg kg^{-1} (0.1%)	4 mg kg^{-1} (0.4%)	3 mg kg^{-1} (0.2%)	**7 mg kg^{-1}** (0.3%)
Stearic acid (C18:0)	57 mg kg^{-1} (2.0%)	42 mg kg^{-1} (2.3%)	36 mg kg^{-1} (2.8%)	55 mg kg^{-1} (2.7%)	**91 mg kg^{-1}** (4.3%)
Elaidic acid (C18:1 t)	7 mg kg^{-1} (0.3%)	5 mg kg^{-1} (0.3%)	4 mg kg^{-1} (0.3%)	5 mg kg^{-1} (0.3%)	7 mg kg^{-1} (0.4%)
Oleic acid (C18:1n9)	**150 mg kg^{-1}** (5.3%)	115 mg kg^{-1} (6.5%)	60 mg kg^{-1} (4.7%)	118 mg kg^{-1} (5.8%)	128 mg kg^{-1} (6.1%)
Linoelaidic acid (C18:2n6t)	4 mg kg^{-1} (0.1%)	2 mg kg^{-1} (0.1%)	2 mg kg^{-1} (0.2%)	3 mg kg^{-1} (0.1%)	4 mg kg^{-1} (0.2%)
Linoleic acid (C18:2n6)	**421 mg kg^{-1}** (14.9%)	271 mg kg^{-1} (15.3%)	165 mg kg^{-1} (13.1%)	310 mg kg^{-1} (15.3%)	310 mg kg^{-1} (14.7%)
Arachidic acid (C20:0)	8 mg kg^{-1} (0.3%)	9 mg kg^{-1} (0.5%)	8 mg kg^{-1} (0.6%)	9 mg kg^{-1} (0.5%)	**21 mg kg^{-1} (1.0%)**
gamma-Linolenic acid (C18:3n6)	**9 mg kg^{-1}** (0.3%)	5 mg kg^{-1} (0.3%)	4 mg kg^{-1} (0.3%)	6 mg kg^{-1} (0.3%)	6 mg kg^{-1} (0.3%)
Eicosenoic acid (C20:1n9)	**4 mg kg^{-1} (0.1%)**	3 mg kg^{-1} (0.2%)	1 mg kg^{-1} (0.1%)	3 mg kg^{-1} (0.1%)	2 mg kg^{-1} (0.1%)
alpha-Linolenic acid (C18:3n3)	**1625 mg kg^{-1}** (57.4%)	943 mg kg^{-1} (53.2%)	635 mg kg^{-1} (50.2%)	1053 mg kg^{-1} (51.9%)	878 mg kg^{-1} (41.5%)
Eicosadienoic acid (C20:2n6)	1 mg kg^{-1} (0.0%)	< 1 mg kg^{-1} (0.0%)	< 1 mg kg^{-1} (0.0%)	< 1 mg kg^{-1} (0.0%)	1 mg kg^{-1} (0.1%)
Behenic acid (C22:0)	12 mg kg^{-1} (0.4%)	13 mg kg^{-1} (0.8%)	14 mg kg^{-1} (1.1%)	14 mg kg^{-1} (0.7%)	**43 mg kg^{-1}** (2.0%)
Lignoceric acid (C24:0)	40 mg kg^{-1} (1.4%)	23 mg kg^{-1} (1.3%)	40 mg kg^{-1} (3.1%)	39 mg kg^{-1} (1.9%)	36 mg kg^{-1} (1.7%)
Nervonic acid (C24:1n9)	1 mg kg^{-1} (0.0%)	<1 mg kg^{-1} (0.0%)	<1 mg kg^{-1} (0.0%)	1 mg kg^{-1} (0.1%)	**3 mg kg^{-1}** (0.2%)
Docosahexaenoic acid (C22:6n3)	<1 mg kg^{-1} (0.0%)	<1 mg kg^{-1} (0.0%)	<1 mg kg^{-1} (0.0%)	<1 mg kg^{-1} (0.0%)	1 mg kg^{-1} (0.1%)
LA/ALA Ratio	0.26	0.29	0.26	0.29	0.35
% PUFAs/All fatty acids	72.7%	68.9%	63.8%	67.6%	56.9%

*Dihomo-γ-linolenic Acid (C20:3n6), arachidonic acid (C20:4n6), eicosapentaenoic acid (C20:5n3), docosatetraenoic acid (C22:4n6), docosapentaenoic acid (n-6, C22:5n6), and docosapentaenoic acid (n-3, C22:5n3) were also analysed but either yielded concentrations below 1 mg kg^{-1} on a fresh matter basis or were not detected.

**Values in bold indicate that the fatty acid content of the respective variety is at least 25% higher than the average across all varieties (the 25% threshold was chosen arbitrarily and has no statistical significance).

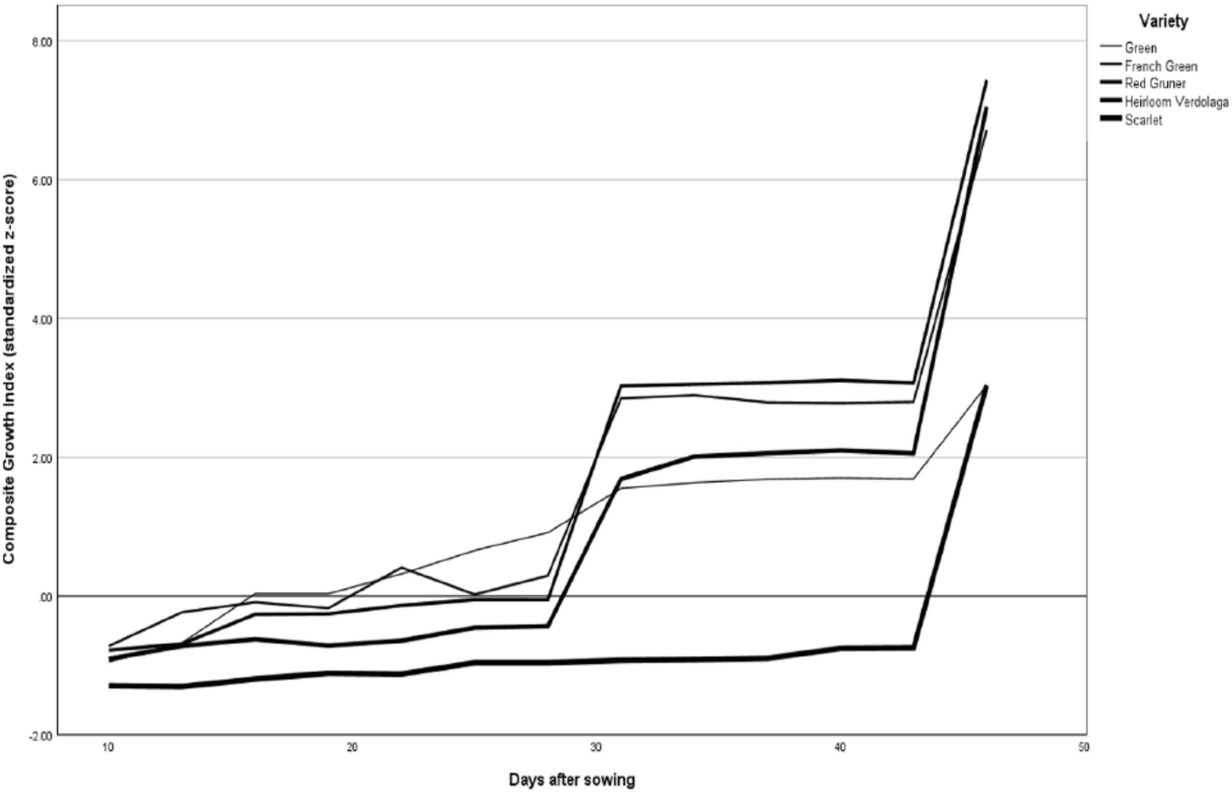

Fig. 2. Temporal development of the composite z-score growth index for five purslane varieties across sampling dates between 10 and 46 DAS. The index represents the mean of standardized plant height and diameter measurements on a 3-day interval and reflects relative growth performance over time

approximately 15% for women to decrease the risk of coronary heart disease and other illnesses (Stark *et al.*, 2008). With a growing population of vegan consumers who cannot rely on common ALA sources such as fish, these results underline the potential of purslane as a nutritious leafy green and demand more varietal research on this plant.

CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

ETHICS STATEMENT

The authors confirm that the research meets any required ethical guidelines, including adherence to the legal requirements of the study country. This study was conducted in accordance with local legislation and institutional requirements. As the research did not involve human participants, animals, or any biohazards, no formal ethics committee review was required.

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AUTHOR CONTRIBUTIONS

Conceptualization: RE; Data curation: JW; Formal analysis: RE; Funding acquisition: RE; Investigation: JW; Methodology: RE; Project administration: RE; Resources: RE; Supervision: RE; Validation: RE and JW; Writing – original draft: RE; Writing – review & editing: RE and JW.

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DATA AVAILABILITY

All data generated and analysed in this study are publicly available through the Dryad Digital Repository. The dataset has been curated and deposited to ensure long-term preservation, open access, and reuse in accordance with FAIR data principles. During the project period, data were stored and managed through the Montana State University (MSU) Information Technology Center (ITC) following the MSU Data Stewardship Plan and institutional data security guidelines. The Dryad repository provides permanent access to the finalized dataset under the persistent digital object identifier (DOI): https://datadryad.org/dataset/doi:10.5061/dryad.3ffbg79zw

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