Evaluating baby-leaf salad greens for spring and fall production in Northwest Washington

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Baby-leaf salad greens defined

- **Young, tender leaves harvested at approximately 4 inches in length**
- **Lettuce, spinach, arugula, beet greens, kale, pac choi, raddichio, mache, chicory**
- **Colors and flavors blended for sensory contrast**

Initial Inspiration

- **Small scale organic direct-market growers approached the WSU Whatcom County Extension office for advice on growing baby-leaf salad greens.**
- **Indicated a need for leafy greens research specific to baby-leaf cultivation.**

Economic importance of baby-leaf salad greens

- **Baby-leaf mixes have been sold in U.S. supermarkets since the 1990's.**
- **Mostly produced in Salinas Valley, CA where baby-leaf production by pound has increased by 200% from 1998 to 2008.**
- **USDA only provides information on sales, per capita consumption, cultivation, and postharvest storage for leafy greens grown to maturity.**
- **High-value specialty crop when marketed as 'spring mix' or 'mesclun mix'**

Sources: Hardesty 2008, USDA 2007 Census of Agriculture

Large-scale distribution of baby-leaf salad mix

- **Earthbound Farms Organic Spring Mix**
- **60% of all Earthbound Farms spring mix grown in Salinas Valley, CA on 150 farms**
- **Large, mechanized production systems.**
- **Earthbound combines product at central processing facility, passes product on to distributor for sale nationwide**

Direct-market distribution of baby-leaf salad mix

- Marketed extensively in Northwest Washington through farmers markets, CSA's, and food co-ops

- Number of farms marketing directly to consumers increased by 25% from 1997 to 2007, total value of farm products sold directly to consumers increased by 100%.

- Seeded and harvested primarily by hand on small-scale diversified direct-market farms

Source: USDA 2007 Census of Agriculture, 1997 Census of Agriculture

Northwest Washington Climate

- **Maritime climate, temperate with late frosts, high humidity**
- **Average temperature 50.6 F in spring, 52.0 F in fall**
- **Leafy greens are tolerant of cool, moist conditions**
- **Northwest Washington growers have otherwise limited production options in spring and fall**

Source: Office of the Washington State Climatologist

Map of Washington

Trials in this project take place in Whatcom and Skagit counties.

Grower challenges in Northwest Washington

- Mild conditions contribute to high incidence of pests and disease
- Year-round weed pressure
- Early bolting in spring and fall
- Achieving good stand establishment
- Labor-intensive production process

Selecting Suitable Varieties for Northwest Washington

- **Mitigate grower challenges by evaluating varieties for**
  - **cold tolerance**
  - **pest resistance**
  - **disease resistance**
  - **bolting resistance**
  - **quick and even stand establishment**

- **10 varieties were evaluated in replicated variety trials at WSU Mount Vernon NWREC in Skagit County and Cloud Mountain Farm Center in Whatcom County for performance in spring and fall**

Experimental Methods

- **Randomized complete block design**
- **Trials were planted in Fall 2012, Spring 2013, Fall 2013, and will be planted in Spring 2014.**
- **2 planting dates per season, 2 weeks apart**
- **Each of the 10 varieties planted in a 10-foot plot on raised beds per rep**
- **3 replications per planting date**

Experimental Methods

- **Varieties chosen fall into crop types most commonly combined in baby-leaf mixes: brassicas, chenopods, and lettuces**

- **Seed was donated by Wild Garden Seed, Osborne Seed Company, and Johnny's Selected Seeds**

Experimental Methods

•Fields managed organically

• Fertilizer WilGro Proganic 8-2-4 was applied at a rate of 50 lb N/acre.

• Beds were shaped with a raised bed mulch layer and were 3 feet wide and 6 inches tall

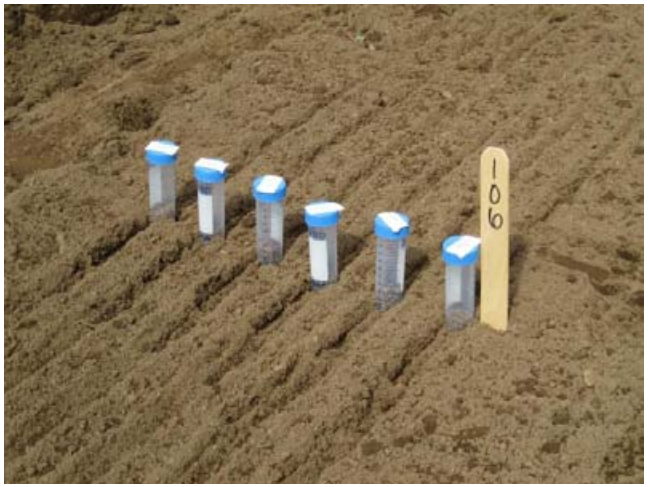
• Beds irrigated using two strips of drip tape as needed, 1 inch per week

Planting Methods

- **Amount of seed required for each row calculated and measured out volumetrically**

- **Rows were marked with a welded stamp to create depressions in soil for planting**

- **Pre-weighed seed distributed by hand into each row and covered up with a fine layer of soil**



Harvesting Methods

- Center 3 feet of each plot harvested when leaves reached 4 inches in length

- Harvested material sorted into marketable leaves, unmarketable leaves, and weeds

- Length of 10 random marketable leaves and number of holes in 10 random unmarketable leaves recorded

Postharvest Analysis

- **200 grams of marketable leaves from each plot stored in unsealed plastic produce bags at 4C**

- **Evaluated visually twice a week for decay, discoloration, wilting, and visual quality**

Postharvest Analysis

Table 3. Rating scale for lettuce quality adapted from Kader *et al*. (1973).

Score	Decay	Discoloration	Wilting	Visual Quality
1	None	None, fresh cut appearance	None	Excellent, essentially free from defects
3	Slight, slightly objectionable, may impair salability	Slight	Slight, not objectionable	Good, minor defects; not objectionable
5	Moderate, objectionable definitely impairs salability	Moderate	Moderate, becoming objectionable	Fair, slightly to moderately objectionable
7	Severe, salvageable but not salable	Severe	Severe, definitely objectionable	Poor, excessive defects, limit of salability
9	Extreme, not usable	Extreme, very dark or yellow	Extreme, not acceptable	Extremely poor, not usable

Data Analysis

- **SAS 9.2**

- **Used ANOVA to analyze the effects of season, planting date, location, and variety on days to harvest, total yield, marketable yield, weed weight**

Preliminary Results

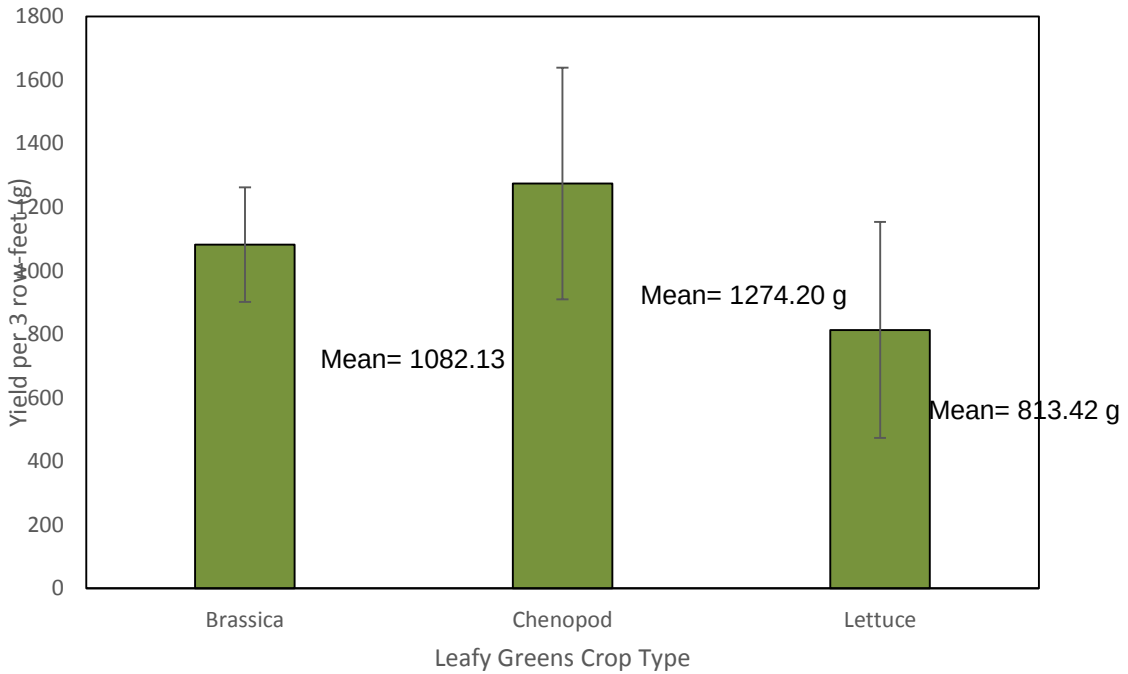


Figure 1. Total crop yield per three row feet of brassicas, chenopods, and lettuce in Fall 2012 and Spring 2013 variety trials at WSU NWREC and Cloud Mountain Farm Center. There is no significant difference in yield between the three crop types (p= 0.2253).

Preliminary Results

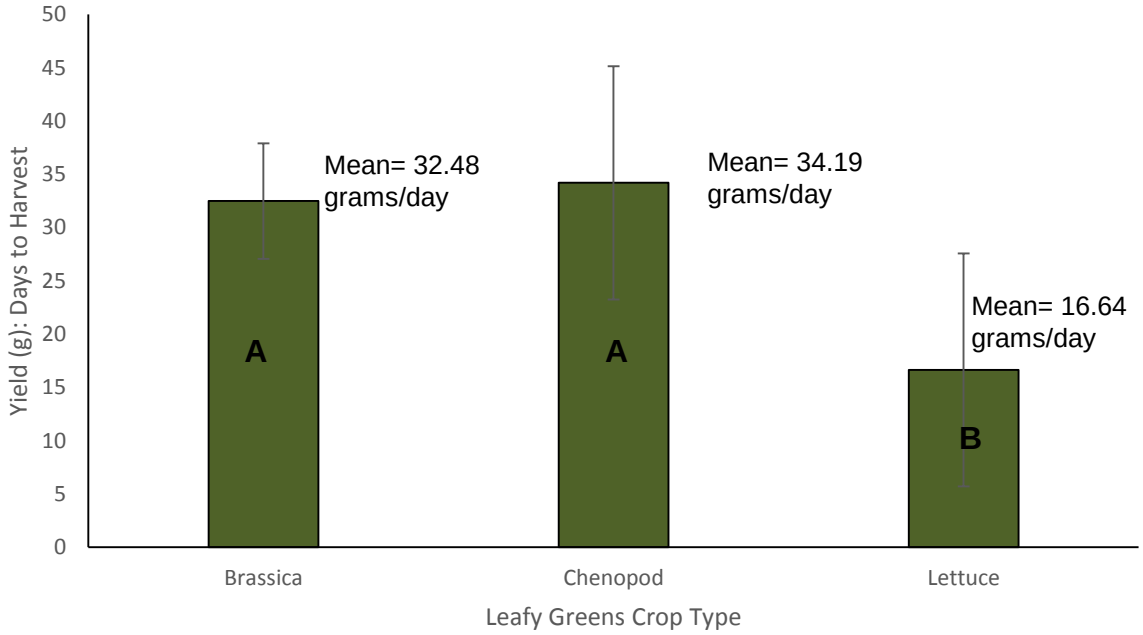


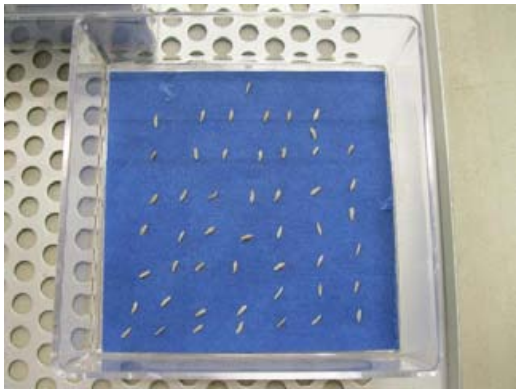
Figure 2. Yield per days to harvest ratio by crop type in Fall 2012 and Spring 2013 WSU NWREC and Cloud Mountain variety trials. Lettuce has a significantly lower yield: days to harvest ratio than brassicas and chenopods (p= 0.0234).

Evaluating USDA lettuce germplasm

- Lettuce germinates and grows slowly, competes poorly with weeds

- However, lettuce is the leading economic vegetable crop in the U.S. and is in high demand year-round.

- Identify lettuce germplasm that germinates quickly at 4 C



Survey local large-scale food purchasers

- **Bridging communication gap between large-scale food purchasers and local leafy greens growers**

- **Survey local large-scale food purchasers such as restauranteurs and food retailers for information on preferred leafy greens attributes, packaging preferences**

- **Distribute this information to local baby-leaf growers**

Evaluate mechanical seeding and harvesting equipment

- Evaluating equipment for small to mid-sized production systems

- 5 mechanically seeded and harvested on-farm trial sites

- Surveying growers to determine their perception of the equipment, barriers to adoption

Organic weed management in baby-leaf production systems

- **Trialing bed flaming as a method of weed management for baby-greens production**

- **Flaming beds either before or after seeding, measuring weed count and germination rate**

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