SKAGIT
Farmers Supply

# THE NACHURS® HIGH YIELD POTATO PROGRAM

NACHURS®

PROVIDING POTATO GROWERS
PREMIUM LIQUID STARTER AND FOLIAR NUTRIENTS SINCE 1946

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# THE NACHURS® HIGH YIELD POTATO PROGRAM

**"The NACHURS potato program provides sustainable, efficient solutions for your potato acre, focusing not only on high yields and profitability but soil health and rhizosphere chemistry as well."** - Tommy Roach, Director of Specialty Products & Product Development

## INTRODUCTION

Potatoes (Solanum tuberosum) are a herbaceous, perennial nightshade that produces tubers, which are actually thickened stems that are very rich in starch. They rank as the world's fourth most important food crop, after maize (corn), wheat, and rice. The potato belongs to the botanical family Solanaceae, and shares the genus Solanum with at least 1,000 other species, including tomato and eggplant. Potatoes are a very important crop for many growers in the Pacific Northwest (i.e. Washington State, Oregon). From 2014 USDA reports, growers in this geography planted a total of 210,000 acres of potatoes consisting of russet, gold, red, white, seed potatoes, fresh-market, etc.

There are many ways to fertilize a potato plant in order to increase production. However, in order to achieve productivity and quality to the highest degree, the principles of 4R Nutrient Stewardship Program must be adhered to. This employs using the right fertilizer sources, applied at the right rate so as not to damage the environment, used at the right time and the right place for optimum plant utilization.

## POTATO GROWTH AND DEVELOPMENT

Potatoes will grow on most soils, with light/medium texture soils being the preferred choice for ease of harvesting (i.e. mechanical). NACHURS Potato Program is based on a balanced fertility program utilizing preplant (i.e. dry broadcast), at planting (i.e. in-furrow, 2x2) and foliar nutrition applications. Potato growth is classified into five distinct growth phases (Fig. 1), and will vary based on environment, management, and cultivar interactions. These stages of growth will need to be considered when managing water and nutrients for optimum crop growth and development (Fig 2.)


**STAGE I SPROUT DEVELOPMENT**
Sprout develops from eyes on seed tubers and grows upward to emerge from the soil. Roots begin to develop at the base of emerging sprouts.

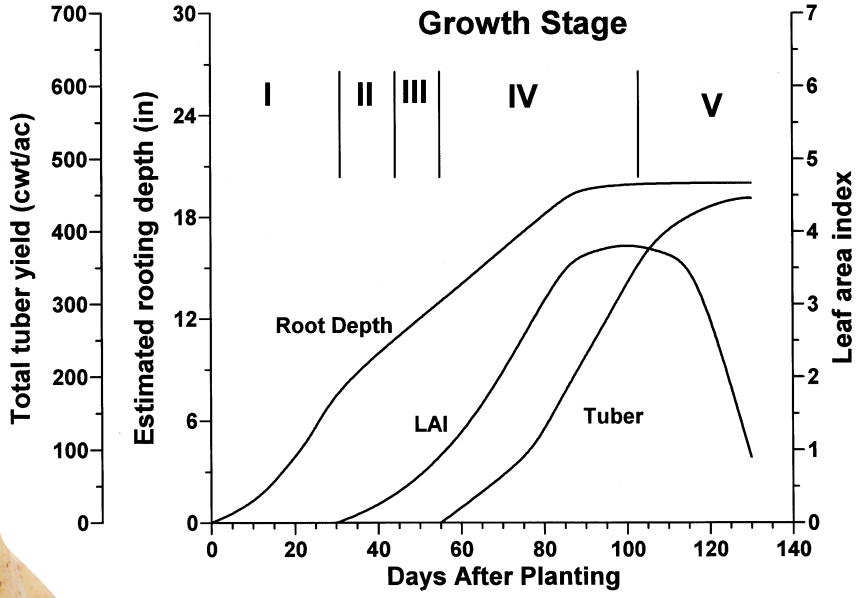
**STAGE II VEGETATIVE GROWTH**
Leaves and brunch stems develop from aboveground nodes along emerged sprouts. Roots and stolons develop at below-ground nodes. Photosynthesis begins.

**STAGE III TUBER INITIATION**
Tubers form at stolon tips but are not yet appreciably enlarging. In most cultivars the end of this stage coincides with early flowering.

**STAGE IV TUBER BULKING**
Tuber cells expand with the accumulation of water, nutrients, and carbohydrates. Tubers become the dominant site for deposition of carbohydrates and mobile inorganic nutrients.

**STAGE V MATURATION**
Vines turn yellow and lose leaves, photo-synthesis decreases, tuber growth slows, and vines eventually die. Tuber dry matter content reaches a maximum and tuber skins set.

Figure 1. Main stages of growth and development of potatoes. The nutritional requirements of the developing potato change during the growing season.
Source: Nutritional Recommendations for Potatoes, Haifa




**Generalized seasonal progression of rooting depth, leaf area index (LAI), and tuber yield of potato.**

Figure 2. Source: Potato Irrigation Management, University of Idaho Extension System

## NUTRIENT REQUIREMENTS

A balanced fertility program is essential in achieving maximum potato growth and development for high yield potential. All nutrients are required for optimum performance (Table 1) and are needed at specific growth stages (Fig. 3).

### Function of plant nutrients

| Nutrient | Functions |
|---|---|
| Nitrogen (N) | Synthesis of proteins for growth |
| Phosphorus (P) | Cellular division, formation of energetic structures |
| Potassium (K) | Transport of sugars, formation of starch, stomata control, co-factor of enzymatic reactions, reduces susceptibility to plant diseases |
| Calcium (Ca) | Building block in cell walls, reduces susceptibility to plant diseases |
| Magnesium (Mg) | Part of chlorophyll molecule |
| Sulfur (S) | Synthesis of essential amino acids |
| Boron (B) | Cell wall formation, germination and elongation of pollen tube, metabolism and transport of sugars |
| Copper (Cu) | Influences the metabolism of nitrogen and carbohydrates |
| Iron (Fe) | Chlorophyll synthesis |
| Manganese (Mn) | Aides in photosynthesis |
| Molybdenum (Mo) | Component of nitrate-reductase and nitrogenase enzymes |
| Zinc (Zn) | Auxin synthesis |

Table 1. Source: Nutritional Recommendations for Potato, Haifa

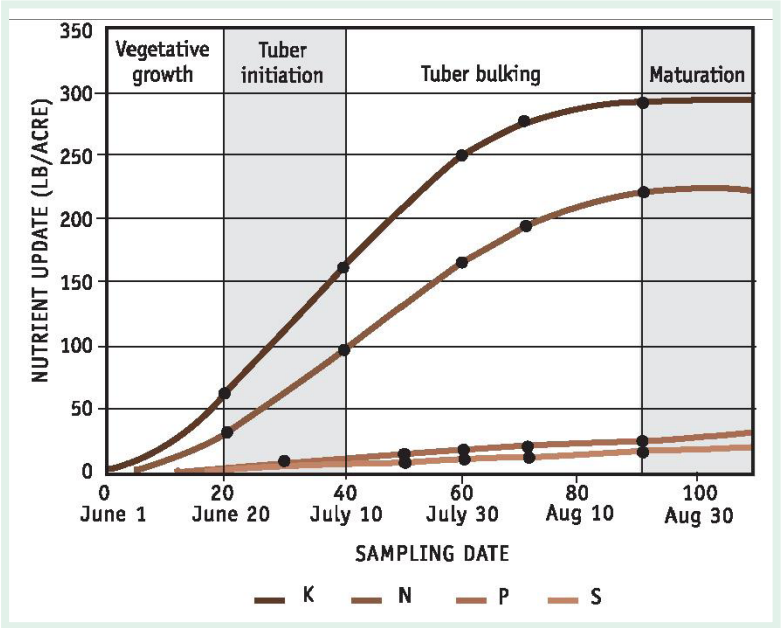



Fig 3. N, P, K, S uptake based on growth stage.
Source: Nutrient Management; Hopkins, Stark, Westermann, Ellsworth

High yielding potatoes require a large amount of nutrients at the right time, especially nitrogen and potassium. (Table 2). Regardless of variety (red, chip, white, russet, sweet, etc.), all potatoes generally require the same quantity of nutrients for proper growth and development. Potassium is particularly important for prompt availability, as 60% to 70% of the total uptake occurs between 30 and 60 days after emergence (DAE) with as much as 15-20 pounds per day being required. As with all plants, available and adequate potassium ensures the plants functionality.

## Nutrient requirements for potato production

| | Removal by yield (lbs/ac) | | | | | | Uptake by whole plant (lbs/ac) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tons/ac | N | $P_2O_5$ | $K_2O$ | CaO | MgO | Tons/ac | N | $P_2O_5$ | $K_2O$ | CaO | MgO |
| 10 | 43 | 20 | 114 | 2 | 2 | 10 | 118 | 31 | 139 | 33 | 21 |
| 15 | 64 | 30 | 172 | 3 | 3 | 15 | 177 | 47 | 209 | 49 | 32 |
| 20 | 85 | 40 | 229 | 4 | 4 | 20 | 235 | 63 | 278 | 65 | 43 |
| 25 | 107 | 50 | 286 | 5 | 5 | 25 | 294 | 78 | 348 | 81 | 53 |
| 30 | 128 | 61 | 343 | 6 | 6 | 30 | 353 | 94 | 417 | 98 | 64 |
| 35 | 149 | 71 | 400 | 7 | 7 | 35 | 412 | 110 | 487 | 114 | 75 |
| 40 | 170 | 81 | 457 | 8 | 8 | 40 | 471 | 126 | 557 | 130 | 85 |

Table 2. Source: Nutritional Recommendations for Potato, Haifa

## Solubility of potassium sources
(g/100 ml)

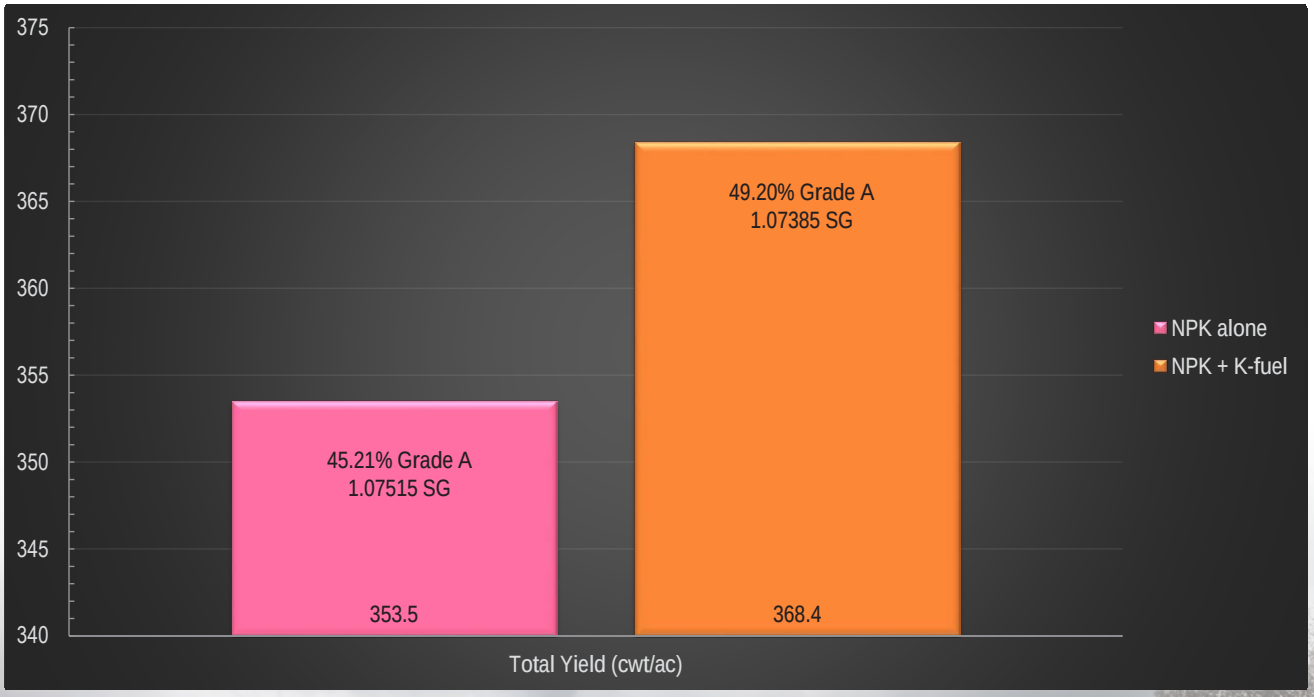
| | |
|---|---|
| **Bio-K** | 255.6 |
| **Potassium hydroxide** | 121.0 |
| **Potassium carbonate** | 112.6 |
| **Potassium sulfite** | 107.0 |
| **Potassium thiosulfate** | 96.1 |
| **Potassium chloride** | 34.3 |
| **Potassium nitrate** | 31.6 |
| **Potassium magnesium sulfate** | 24.4 |
| **Potassium sulfate** | 11.1 |

## Point of deliquescence of potassium sources (% RH)

| | |
|---|---|
| **Bio-K** | 23.3 |
| **Potassium hydroxide** | 44.0 |
| **Potassium carbonate** | 85.0 |
| **Potassium sulfite** | 93.2 |
| **Potassium thiosulfate** | 97.2 |

The use of NACHURS Bio-K® will also improves tuber size and skin set, which decreases days to harvest and increases net profit per acre.

# 2016 Third Party Potato (chip) Trial Summary*
# In-furrow fertility; NPK alone vs. NPK + K-fuel




*2 replicated trial sites in ME, WA
**Treatment 1 – 10 gal NPK in-furrow
**Treatment 2 – 8 gal NPK + 2 gal Nachurs K-fuel in-furrow

# NACHURS PRODUCT RECOMMENDATIONS

The following recommendations are intended as a general recommendation for all potato production. Adjustments can be made according to the end use of the crop produced; chips, processing, table stock, storage, or fresh. They will also vary according to geographic location of the production and soil test levels. Additional fertility (nitrogen, phosphate, micronutrients, etc.) can be applied at various crop stages and will vary based on environmental conditions. Consult your local NACHURS or Skagit field consultant.

1. **At planting, in-furrow:**
   - Apply 2-4 total gal/ac of **Rhyzo-Link® 3-10-13** and/or **NACHURS Triple Option®**, with 1 gal/ac **NACHURS K-fuel®** and 1 qt/ac **NACHURS® 9% Zn EDTA**. Other nitrogen and phosphate can be provided as well based on nutrient levels and production goals.

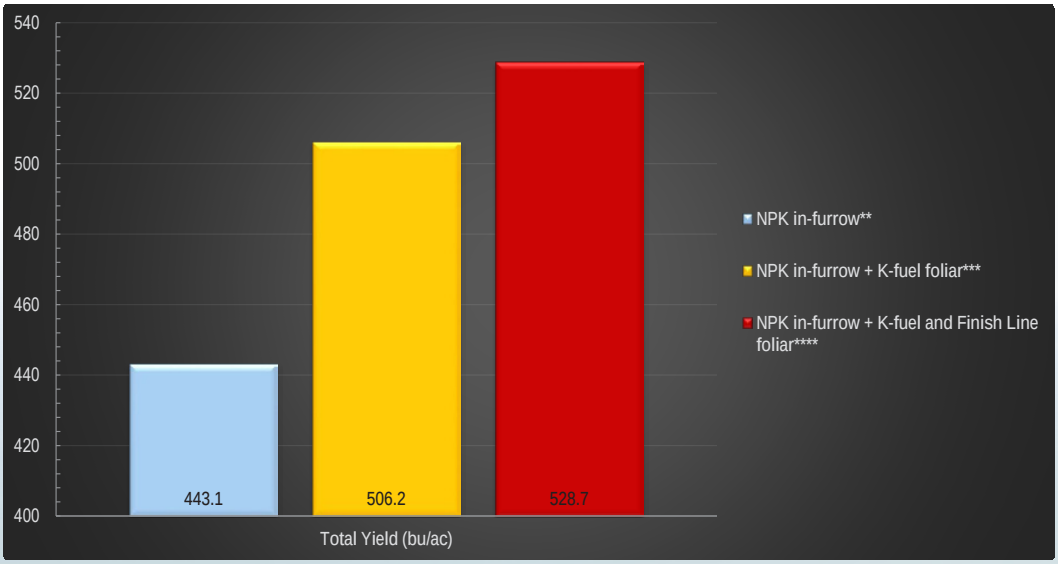
2. **At tuber initiation, foliar:**
   - Apply 1-2 gal/ac of **NACHURS K-fuel®** with 1 qt/ac **NACHURS Finish Line®**. Other nutrients may be included if deemed necessary by tissue analysis.

3. **At tuber bulking, foliar:**
   - Apply 1-2 gal/ac of **NACHURS Triple Option®** with 1 qt/ac **NACHURS Finish Line®**. **NACHURS® 10% Boron** may be added at 1 pt/ac on thin-skinned varieties to begin sugar translocation process.

4. **At maturity, foliar:**
   - Depending on fertility levels early at planting, apply 1 gal **NACHURS Triple Option®** with 1 pt/ac **NACHURS® 10% Boron** at 21 days before vine kill.

DO NOT apply phosphate containing fertilizers 60 days (russet) or 65 days (thin-skinned) after emergence if generous amounts of fertilizer was placed in-furrow at planting. The only exception would be to alter nitrate levels in the plant/tuber.

## 2016 Third Party Potato (russet) Trial Summary*
## In-furrow fertility + K-fuel + Finish Line




*2 replicated trial sites in ME, WA
**In-furrow – 8 gal NPK in-furrow
***Nachurs K-fuel at 2 gal/ac at 35 days after emergence
****Nachurs Finish Line at 1 qt/ac at 35 days after emergence

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## OUR LOCATIONS

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