

# PHORCE

## PRODUCT GUIDE

PHORCE | INCREASES NUTRIENT UPTAKE  
MAXIMISES ROOT DEVELOPMENT



# VERDESIAN

THE NUTRIENT USE EFFICIENCY PEOPLE®

VERDESIAN LIFE SCIENCES EUROPE LTD.



## Introduction

Phorce contains a key biostimulant proven to stimulate crops to grow faster and stronger for a higher quality plant. Phorce optimises the rate of nitrogen uptake from the roots. Foliar applied at 0.5 -2l per hectare to agricultural and horticultural crops, Phorce increases root growth and improves nitrogen efficiency helping to maximise yield potential.

## Major Components:

Active stabilised Potassium Phosphite , 38%  
Nutrient complex N (5) and  $K_2O$ (15)

# The Benefits of Potassium Phosphite



## Overview

The mode of action of phosphite is root-specific, and not related to any role as pesticide or fertilizer. Recent UK studies in wheat, oilseed rape, sugar beet and ryegrass showed that potassium phosphite improved root biomass up to 30% and acted as a specific biostimulant of root growth. Roots provide the means of capturing nutrients and water required to generate a productive photosynthetic crop canopy. Root anatomical properties such as root length, density, depth, root front velocity and angle, all improve resilience under resource poor conditions by enhancing the uptake of water and mineral elements.

These root traits also correlate with an improvement in nitrogen (N) efficiency. It has been proven by two key academic institutions University of Nottingham, UK and University of Kiel, Germany that potassium phosphite treatment increases the activity of Nitrate Reductase, which is a key enzyme in plant nitrogen(N) assimilation. They both demonstrated that potassium phosphite treatment improves plant tolerance to abiotic stresses through improved N assimilation, which is in turn associated with improved root growth.



## Effect on Root growth

Trials\* tested the effect of potassium phosphite on young seedlings in four commercial winter wheat varieties Diego, Leeds, Siskin, and Skyfall. Within 6 days post application these commercial winter wheat varieties showed a significant increase in the seminal root length. The seminal root count in Diego was significantly increased by 18% while its lateral root counts significantly increased by 38% and in variety Leeds by 58%. These results indicate the clear biostimulant impact of potassium phosphite treatment on early root growth leading to improved crop establishment (\*Trial Results in wheat - conducted by the University of Nottingham).

University of Kiel trials in Germany on winter wheat also demonstrated a root mass increase from +7.4% at GS20 to +50% at GS29.



## Effect on Photosynthesis and Water

Improved root traits due to potassium phosphite application also have benefits for water and leaf gas exchange explaining the increase seen in photosynthetic capacity and transpiration rates, leading to improved leaf water use efficiency.

The improved leaf water efficiency also provides extra leaf cooling helping to reduce the impact of high leaf temperatures. Chlorophyll degradation occurs in plants under high temperature stress, and it is shown that potassium phosphite treatment inhibits high temperature chlorophyll degradation reducing abiotic stress on the plant.

## Effect on Assimilation of inorganic N

Tests<sup>\*\*</sup> were conducted to assess the effect of the key enzyme nitrate reductase activity in field grown wheat plants. Plants were treated with phosphite in autumn, spring or both in autumn and spring. The tests detected a significant increase of 51% in nitrate reductase activity in dual potassium phosphite application of autumn and spring. Accordingly, an increased nitrate reductase activity leads to increased assimilation of inorganic N to build up the plant's root, stalk/stem, leaf, and grain/seed.

<sup>\*\*</sup>(This work conducted by Nottingham University in UK supported by the awards from the Biotechnology and Biological Sciences Research Council and by funds from six Industrial Partners including Verdesian Life Sciences Europe Ltd.)

University of Kiel trials in winter wheat and oilseed rape concluded that the increase in nitrate reductase activity can be observed within 9 days post application of Phorce.

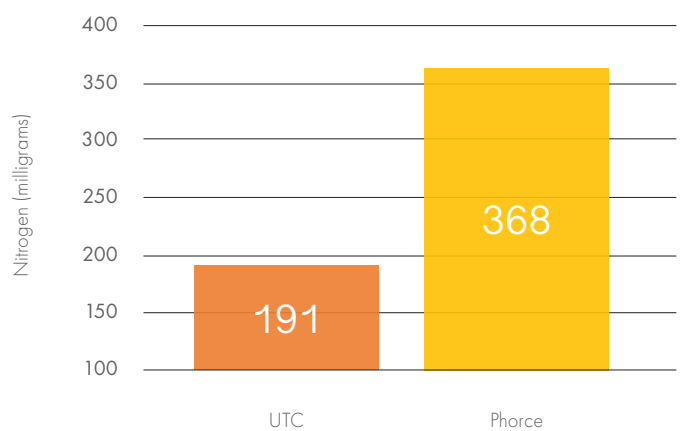


## Benefits of Phorce in Nitrogen Utilisation

Crop plants have been developed over the last 10,000 years and for most of this time they were not heavily fertilized. However, in the last 60 years the nitrogen fertilization of crop plants worldwide has increased more than 20-fold. Unfortunately, the use of this fertilizer is generally inefficient with only about 50% N being taken up by the crop. Therefore, improvements in nitrogen use efficiency and utilisation are important not only for farm economics but also for reducing the impact on the environment through the release of ammonia and greenhouse gas nitrous oxide. It also has the added effect of decreasing leached nitrates that pollute water courses.

In trials conducted by Verdesian the application of potassium phosphite to wheat increased the nitrogen utilisation by 48% versus untreated plants.

### +48% Nitrogen Utilisation



**Analysis 21 days post application**

Source: Verdesian Laboratories, Kansas 2014



# Benefits



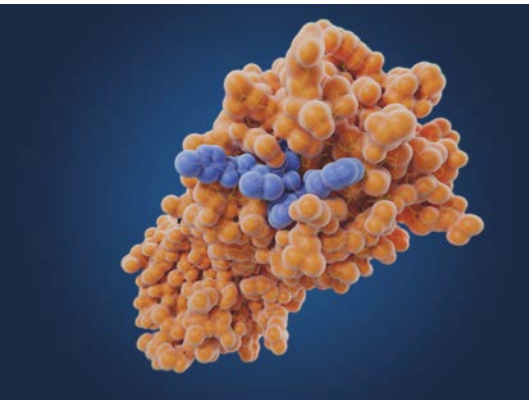
Improved root length and mass



Maximum nutrient use efficiency when applied at early growth stages



Improved crop response under water, heat and nutrient stress conditions



Increased activity of enzyme nitrate reductase improving the assimilation of inorganic N



Increased leaf water use efficiency



Up to 48% increased nitrogen utilisation within the plant



# The Conclusion

## for Phorce

Trial results from Nottingham and Kiel universities clearly demonstrate that Phorce promotes root and shoot growth and improves nutrition use efficiency (root biomass per unit nutrient supply). Improved nitrogen utilisation providing enhanced abiotic stress tolerance. All these benefits combine to result in a stronger more resilient plant enabling the crop to push towards its genetic yield potential.



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