NITROGEN
in PLANTS and RESIDUES

Broccoli Residues

The N content of broccoli residues left in the field can vary considerably. Values ranging from 80 to 265 lbs N/acre have been reported. In the same studies, the amount of N in the heads ranged from 35 to 140 lbs/acre. With an N content of 3.5 to 3.8%, which roughly corresponds to a carbon (C) to N ratio of 11, about 60% of N in the residues mineralizes within 4 weeks in the summer. The mineralized N will be available to the next crop, provided it is not leached below the root zone with excessive irrigation or rainfall.

Tissue Analysis

Optimum whole-leaf nutrient concentrations in recently matured leaves

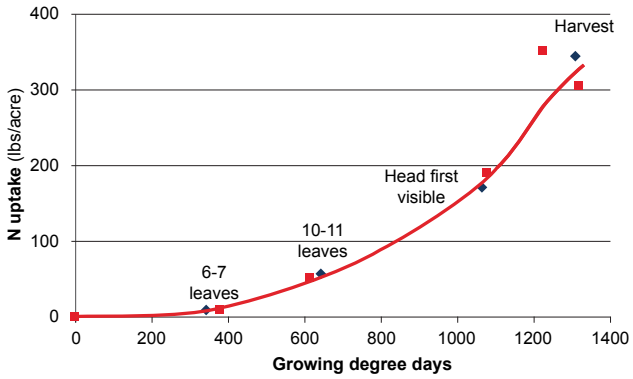
The total N concentration of whole leaves indicates the longer-term N availability, and can be used as a measure to monitor crop N status.

	Sufficiency Range (%)		
Growth Stage	N	PO_4-P	K
First buds	3.0-5.0	0.3-0.75	2.0-4.0
Heading	3.0-4.5	0.3-0.5	1.5-4.0

Petiole NO_3-N concentrations are highly variable, and poor predictors of N fertilizer need. Readings of nitrate concentrations in the petiole fresh sap made with the handheld Cardy meter are correlated with the dry petiole nitrate concentration but are less accurate and not very sensitive indicators of the crops N status. However, petiole nitrate-N may be used as a diagnostic test to confirm N deficiency.

Broccoli Nitrogen Uptake and Partitioning

Seasonal N Uptake



Information regarding broccoli fertility management, including placement, fertilizer source, phosphorus, and potassium, is available at:

cdfa.ca.gov/go/FREPguide

SELECTED REFERENCES

Hartz, T.K., 2007. Efficient nitrogen management for cool-season vegetables.

Le Strange, M., Mitchell, J.P., Jackson, L.E., 1998. Determination of best nitrogen management practices for broccoli production in the San Joaquin Valley. FREP Final Report.

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FERTILIZER RESEARCH AND EDUCATION PROGRAM
FREP

BROCCOLI
NITROGEN Fertilization Guidelines

Online nutrient guidelines for broccoli and other crops, as well as relevant references, are available at:

cdfa.ca.gov/go/FREPguide

The information in this pamphlet is based on research funded by the Fertilizer Research and Education Program, California Dept. of Food and Agriculture, and from other sources.

Daniel Geisseler and William R. Horwath, Department of Land, Air and Water Resources, UC Davis, gathered and organized the guideline information through FREP grant agreement 11-0485.

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Nitrogen Fertilization
PREPLANT and SOWING/TRANSPLANT

Pre-plant or starter nitrogen (N) applications should be modest, because N uptake is low during the first 3-4 weeks after planting, until the 2-3-true leaf stage, and because nitrate is easily leached below the root zone. During this stage, the aboveground biomass of a well-fertilized broccoli crop accumulates less than 10% of the total N. Therefore, large pre-plant or starter applications are not needed.

However, in order to achieve a high yield, it is critical that young plants do not suffer N deficiency. Small quantities of N (20-30 lbs/acre) can be applied either pre-plant or as starter. Even in fields with very low residual soil nitrate concentrations, the pre-plant or starter N application should not exceed 60 lbs/acre in order to reduce the risk of leaching losses.

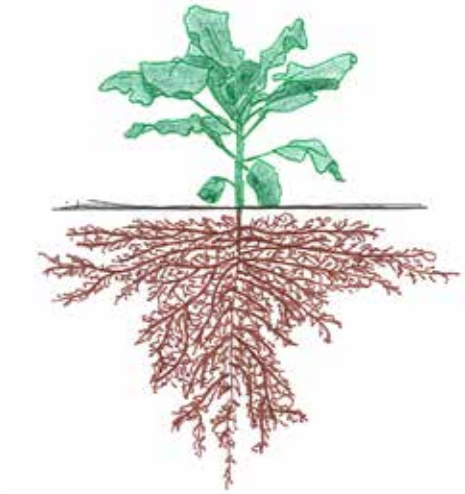
For cole crops, including broccoli, fertilizer can be band-applied at the time of seeding or transplanting. Bands should be located 2-3 inches to the side of the seeds or plants and 2-3 inches below the soil surface. However, acid-based starter fertilizers are often sprayed over the top of the seedline to prevent crusting and supply the N needs of the crop for the first 30 days of the crop cycle.

Nitrogen Fertilization
at ROSETTE STAGE

Based on the N uptake pattern, the first sidedress N application is generally made 4-6 weeks after planting, and the second, if needed, 10-14 days later. N is only applied when the pre-sidedress soil nitrate-N concentration is below 20 ppm. If the nitrate-N concentration in the soil is below 20 ppm, only enough N to increase soil available nitrate-N to 20 ppm is needed. Approximately 4 lbs N/acre need to be added to increase the soil nitrate level by 1 ppm.

Fertilizer can be fertigated or applied in a band.

Under greenhouse conditions, the growth of broccoli has been found to be reduced when the plants receive N solely in the form of ammonium. However, under field conditions, ammonium is generally quickly converted to nitrate by soil microorganisms, so that the difference between ammonium and nitrate fertilizers can be expected to be minimal.



Nitrogen Fertilization
at HEAD DEVELOPMENT and HARVEST

The N uptake rate is high during the last 4-6 weeks before harvest, reaching 4.5-8.5 lbs/acre per day. Well-fertilized plants take up 70-90% of the N during this period. Broccoli also takes up N from deeper in the soil profile later in the crop cycle and acts as an N scavenger. Nitrogen uptake rates generally remain high until harvest.

To minimize leaching losses, seasonal N application rates for broccoli should not exceed 180-240 lbs/acre for winter and spring production and 150-180 lbs/acre for summer and fall production.

For more information and references about N management in broccoli, access the crop fertilization guidelines at:

cdfa.ca.gov/go/FREPguide

Non-fertilizer N, such as nitrate in soil and in irrigation water, can supply significant amounts of N to crops. These N sources are taken into account by CropManage, a web-based irrigation and N management decision support tool developed by UC Cooperative Extension. CropManage is free to use at:

cropmanage.ucanr.edu