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# NPK Inputs At Optimum Growth Stage Critical For Maximizing Yields In Irrigated Chilies

*Two-year field studies conducted in Arizona and New Mexico to collect data for future management and scheduling.*

***Summary:*** *Results of chili field experiments conducted in 2004 and 2005 at Sunsites in Cochise County, Arizona and at the Massey Farm in Animas Valley, New Mexico, indicated that either dry matter or nutrient uptake followed quadratic accumulation patterns. A period of high nutrient demand at 2,000-2,200 heat units accumulated after planting (HUAP) was detected; therefore, NPK inputs prior to this stage of growth would be critical for optimum yield and efficiency. K had the highest uptake rate (0.18 lb/A/HU or 0.20 kg/ha/HU) as compared to N and P uptake (0.12 and 0.01 lb/A/HU or 0.14 and 0.01 kg/ha/HU, respectively).*

Chilies remain a stable and important crop for several crop production areas in the desert southwestern chili belt (New Mexico, Arizona, Texas, and northern Chihuahua, Mexico). Chilies (green and red) in the Sulfur Springs Valley of Cochise County, Arizona, are primarily produced under center pivot irrigation. Chili jalapenos are produced in Pinal County in central Arizona.

Recent trends indicate that demand for crops such as chili peppers in the U.S. is increasing. As a result, an increase in cultivated chili acreage is needed to meet the market demands for this crop. The latest data from the USDA Agricultural Statistics Service showed New Mexico to be the leading state in chili production in the U.S., where about 18,000 acres were committed to production in 2005. Planted acreage in Arizona is estimated at 6,000 to 10,000 acres in recent years (NASS, 2005). The acreage level has increased in Arizona from about 4,000 acres that were reported for 1998. The increase in demand, coupled with more land being committed to chili production, has created the need to enhance basic understanding of chili crop agronomics and general production practices to improve efficiencies.

Accurate prediction of harvest date and developmental stages of a crop has widespread application for improving management of that crop (e.g., fertilization, irrigation, scheduling, multiple harvests, pest management activities, labor and machinery, etc.). We often can monitor

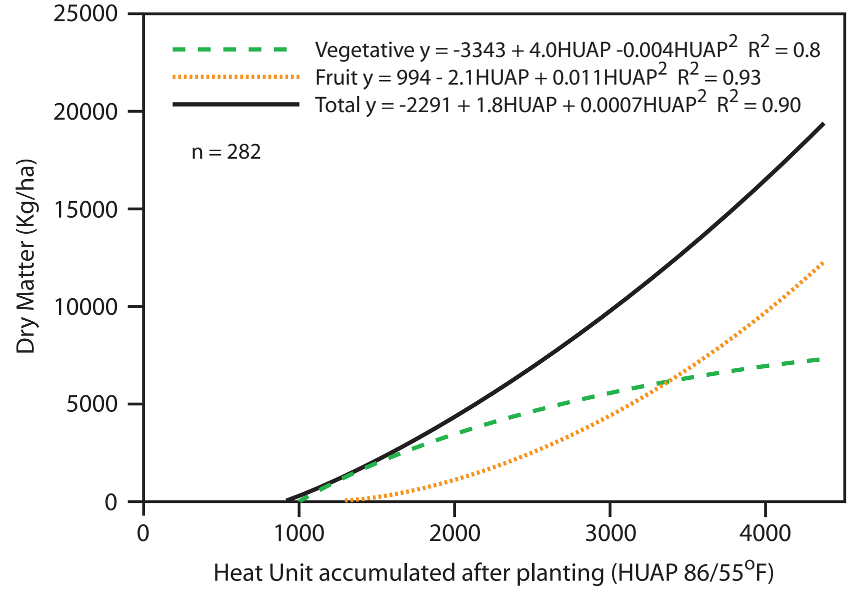


*Figure 1. Chili dry matter accumulation as a function of HUAP, overall means; Arizona/New Mexico, 2004-2005.*

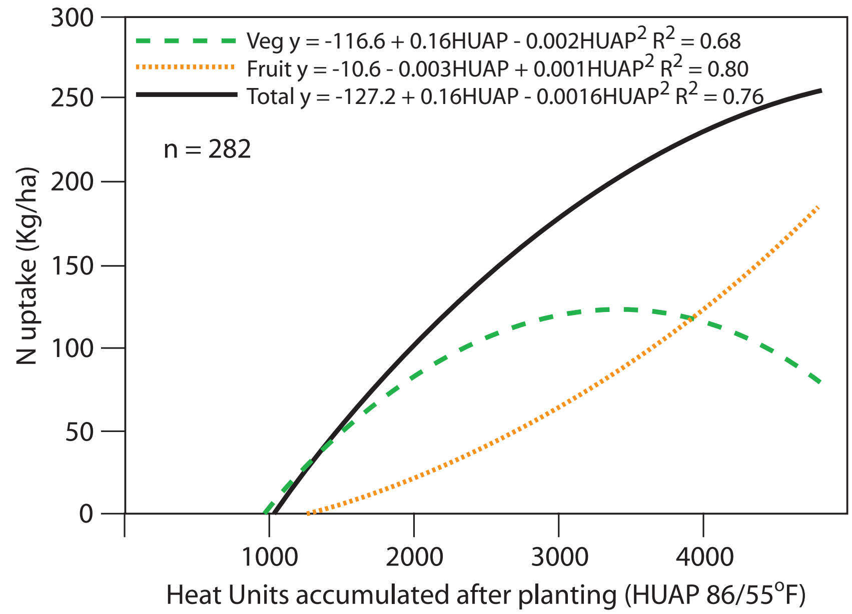


*Figure 2. Chili N uptake as a function of HUAP, overall means; Arizona/New Mexico, 2004-2005.*

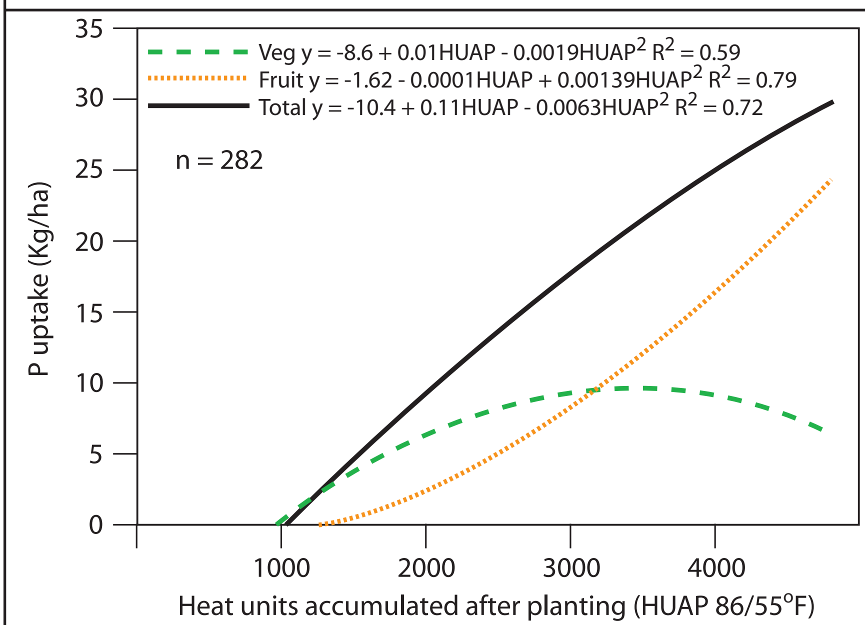


*Figure 3. Chili P uptake as a function of HUAP, overall means; Arizona/New Mexico, 2004-2005.*

and predict development based on measuring the thermal conditions in the plant's environment. Various forms of temperature measurements and units commonly referred to as heat units (HU) or growing degree units, have been used in numerous studies to predict phenological events for both agronomic and horticultural crops.

To describe crop growth and development, there is first the need to determine rate functions for various processes. These include the identification of distinct stages and phases of growth and development, as well as the prediction of duration of developmental phases given temperature regimes.

At present there is very limited information available concerning basic nutrient requirements in terms of 1) dry matter accumulation and nutrient uptake patterns, 2) distribution within the plant and 3) total amounts required for irrigated chilies in the desert southwest. Some relevant information does exist in literature for chilies but it is very limited in scope and the work has dealt primarily with varieties and cultural practices that have changed considerably in recent years. Literature regarding the basic agronomic aspects of chili production in Arizona and the region is virtually nonexistent.

Therefore, there is a distinct need to develop an understanding for optimum fertilization and nutrient management of irrigated chilies in the desert southwest. Hence the objective of this two-year study was to analyze dry matter accumulation and nutrient uptake patterns as a function of heat units accumulated after planting (HUAP).

## Dry matter

***Accumulation.*** As can be seen from Figure 1, overall dry matter accumulation followed a quadratic pattern. At physiological maturity, total dry matter accumulation averaged 7,100 lbs/A (8,000 kg/ha). At the same stage, 40 percent of total dry matter was allocated into the fruit.

Beyond physiological maturity, fruit dry matter allocation rates were higher than

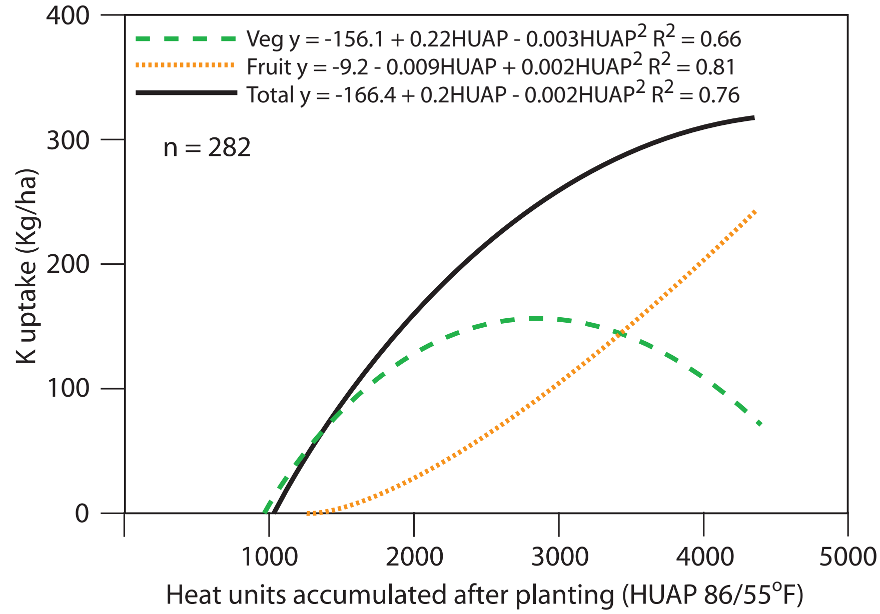


*Figure 4. Chili K uptake as a function of HUAP, overall means; Arizona/New Mexico, 2004-2005.*

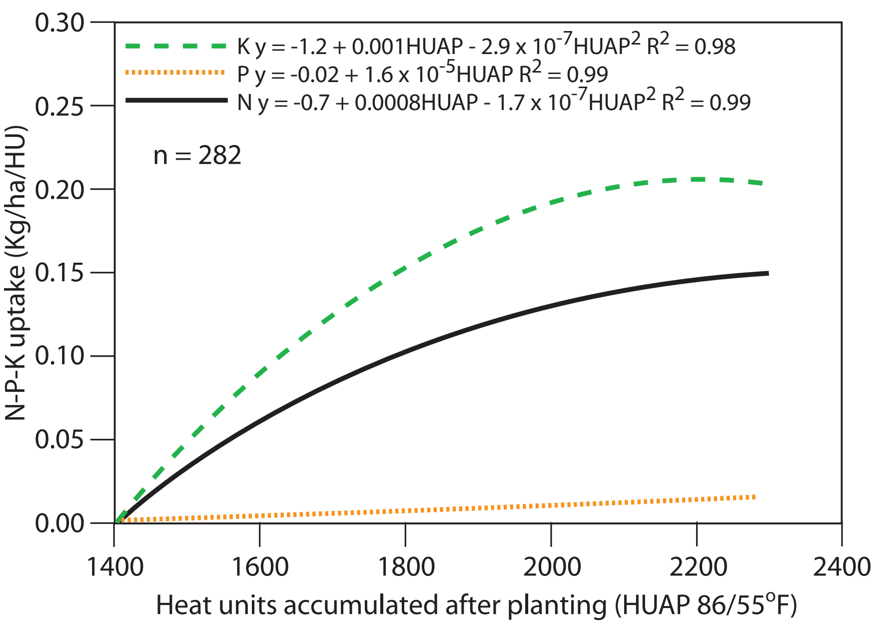


*Figure 5. NPK flux as a function of HUAP, overall means; Arizona/New Mexico, 2004-2005.*

that of vegetative dry matter allocation rates.

The highest dry mater allocation rates into the chili fruit (pods) were found to be around 2,000 to 2,200 HUAP, which corresponds to physiological maturity.

## Nutrients

***Uptake patterns.*** Overall results concerning nitrogen (N), phosphorus (P), and potassium (K) uptake patterns are shown in Figures 2,3,4. NPK maximum uptake levels averaged 180, 18, and 250 lbs/A or 200, 20, and 280 kg/ha, respectively.

A period of high nutrient demand at 2,000 to 2,200 HUAP, which corresponds to physiological maturity, was detected as shown in Figure 5. Therefore, fertilizer inputs prior to this stage of growth would be critical for optimum yield and efficiency, particularly for N. In addition, K had the highest uptake rate (0.18 lb/A/HU or 0.20 kg/ha/HU) as compared to N and P uptake rate (0.12 and 0.01 lb/A/HU or 0.14 and 0.01 kg/ha/HU, respectively).

These data can be used for the development of management guidelines for chili fertilizer management and scheduling.


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