of the kernels in the 5.0 to 21.0% range (Fig. 3). Some effect was noted, however, at very low and high O\textsubscript{2} partial pressures. The color of kernels at 2.5 and 100% were substantially darker (lower “L” values) than those at 5.0 to 21.0% O\textsubscript{2}. In addition, the color differed considerably between the low and high O\textsubscript{2} extremes. Kernels at 2.5% O\textsubscript{2} had a distinct dark discoloration while kernels from the 100% O\textsubscript{2} treatment were significantly redder, both visually and as indicated by significantly higher Gardner “a” values.

Discussion

Kernel color is a primary factor in the quality rating of shelled pecans in the U.S. and as a consequence it has a pronounced effect on market price. While an increasing amount of information is presently available on the horticultural, handling, and storage parameters effecting discoloration and the chemistry of the reactions, little has been established as to the factors controlling the induction and development of the normal complement of kernel pigments during maturation on the tree.

The distinction between normal pigmentation and discoloration is a relatively flexible subjective parameter, based on the industry’s and government’s criteria for quality, artificially imposed on the kernel. Most discoloration (e.g. the formation of phlobaphenes and anthocyanidins) with a few exceptions (e.g. ammonia damage) represents the normal development of pigments in response to maturation and environment. For continuity, however, discoloration is treated here as any color change resulting in the movement to or toward a lower U.S.D.A. color grade.

The results presented in this paper indicate that internal O\textsubscript{2} partial pressure is not a major factor in the induction and development of normal pigmentation. Two lines of evidence support this position: 1) the relatively high internal O\textsubscript{2} concn prior to dehiscence, 2) the distinct absence of an O\textsubscript{2} effect on color in the concn range of 5.0 to 21.0%, a range substantially wider than found within the nut.

In addition, an increase in internal O\textsubscript{2} concn at dehiscence does not trigger pigment development since one would expect a sequential development of pigmentation starting at the highest O\textsubscript{2} concn. This, however, was not the case. The lowest “L” values (darkest kernels) after 7 days storage were at 5.0% O\textsubscript{2} with no distinct sequence developing between O\textsubscript{2} concn and time (data were not included).

The increased coloration of the 100% O\textsubscript{2} treatment after 21 days probably represents the development of discoloration. Oxygen partial pressure is a major factor in the development of discoloration (principally red-brown) of pecans in storage (2) much of which occurs through the oxidation of leucocyanidin and leucoleodelphinidin (4). The extremely high O\textsubscript{2} concn used and the high “a” value both point toward an artificial color change, that is pigmentation other than that normally produced during maturation.

Literature Cited


The Influences of Nitrogen on Pepper Transplant Growth and Yielding Potential of Plants Grown with Different Levels of Soil Nitrogen\textsuperscript{1}

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Abstract. Pepper transplants grown with 240 or 300g N/m\textsuperscript{3} were the tallest, and subsequently the highest yielding when grown to maturity with 155 kg/ha soil N. At 100, 210 or 265 kg N/ha, transplants grown for 6 weeks with N level of 300g/m\textsuperscript{3} were the highest yielding. The optimum level of leaf N for 6 week-old transplants is approximately 3.7% dry wt.

Studies on N nutrition of pepper plants by Cochran (2) and Maynard et al. (6) generally agree that fruit set was enhanced by the highest level of N used in each experiment. Ozaki and Ray (8), on the other hand, could find no effect of N on yields. However, Thomas and Heilman (10) showed that N levels in field soils beyond 134 kg/ha reduced yields and experiment station recommendations (1, 3) caution growers not to use too much N before plants have set some fruits.

The objectives of this study were to determine the effect of N on the growing transplant and its effect on yields when the plants are grown to maturity at different N levels in greenhouse soil beds.

Materials and Methods

These studies were conducted in a growth chamber and in a greenhouse. Seeds of sweet pepper ’Yolo Wonder-L’ were germinated in an unfertilized medium of equal parts peat-moss and vermiculite and grown for 2 weeks at 24°C (day) and 18°C (night). The light intensity was about 36.8 klx.

Transplants were grown in a mixture of 1 peat moss:1 vermiculite fortified with 0.5, 0.3, and 5.9 kg/m\textsuperscript{3} of P, K, and
Results

Influence of N on transplant growth. Growing transplants to first anthesis required 10 weeks for those grown at 24°C, 8 weeks for those grown at 27°C, and 6 weeks for those grown in the greenhouse during the summer months. Low temp retards growth and increases days to flowering in pepper (2, 4). Plants grown at 24°C (Table 1) with 240 g N/m² were tallest and those grown at 27°C with the same level of N were as tall as those grown with higher levels of N. Of the transplants grown in the greenhouse, those grown with 240 g N/m² (Table 2) were also the tallest. Plants grown with the highest level of N, regardless of the growing regime, had larger and darker-green leaves than those grown at lower levels of N. Fresh leaf wt of the greenhouse-grown transplants grown with the highest N was the heaviest (Table 2), but there was no significant correlation \((r=0.152)\) between leaf wt and ht. This additional fresh leaf wt was attributed to higher water content since dry wt of these leaves was not greater than that of plants grown with 300 g N/m².

Influence of N on elemental concn of transplants. Transplants grown with 360 g N/m³ contained the most total N (Tables 1 and 2). P was highest in plants grown with 300 and 360 g N/m³ (Table 1). There were no differences in K, Ca, and Mg after 10 weeks at 24°C (Table 1) and K and Ca after 8 weeks for those plants grown at 27°C. In contrast, transplants grown with 300 g N/m³ in the greenhouse had the most K (Table 2). Miller (7) found that when N was varied, pepper plants grown for 99 days with medium N contained the highest level of K, Ca, and Mg in their stems. The levels of K and Mg in his study were lower, while Ca was much higher than the levels found in leaves of pepper transplants in this study. Generally, Ca is known to be highest in old tissues (9).

Leaves of transplants grown in the greenhouse with 180 g N/m³ were light-green and exhibited typical symptoms of N deficiency prior to transplanting into the soil beds. The leaf N concn of these plants was 3% (Table 2).

Influence of N on yield. Plants grown with a soil-N level of 155 kg/ha produced the highest yields (Table 3). Of plants grown with other soil-N levels, those grown as transplants with 300 g N/m³ were the highest yielding (Table 3). Within the soil-N level of 155 kg/ha, those grown as transplants with 240 g N/m³ were higher yielding than those grown with either 180 or 360 g N/m³. The higher yields of those grown with 155 kg/ha were due mostly to more fruits per plant than produced on plants grown at other levels of soil-N.

Influence of N on concn of leaves. Nitrogen concn of leaves was the same after 1 month (Table 3) but there were some differences owing to treatments after 2 months. Only on Oct. 27 was there a significant correlation \((r=0.536)\) between N concn and leaf wt.
Discussion and Conclusions

Our data indicate that about 3.7% leaf N is necessary for transplants at their setting out stage, and lower or higher N levels at this time may cause plants to perform at a reduced level. Thomas and Hielman (10) reported that the critical level of N was about 4%. They derived this critical level by periodically testing and relating the leaf N to visual symptoms of N deficiency. They observed N deficiency in plants with N concn of 3.8-4%. Miller (7) observed N deficiency at a N level of 1.26%, while Maynard et al. (6) reported that N deficiency is visible well above the N level reported by Miller. It should be noted that the conclusions of Maynard et al. were based on data for leaves of 195 day-old plants and Miller’s conclusions were based on data for stems of 99 day-old plants. Transplants grown with 180g N/m³ in this study definitely exhibited N deficiency, while those grown with 360g N/m³ were dark-green and succulent. Transplants grown with the highest N had a leaf concn of 4.86% N and were considerably lower yielding than those grown with 300g N/m³.

Levels of N appeared to have increased for the first 2 months and then gradually decreased for all plants as the season progressed and with fruiting (Table 3). MacLean et al. (5) reported a decrease in N of tomato leaves as the season progressed. Since all plants contained about the same levels of N one month after setting into the soil beds, the N-data at that time and again 2 months after setting out gave no indication as to which plants were or were going to be the highest yielding. Nevertheless, the N level at which the pepper transplant is grown appears to have a strong influence on its yielding potential.

Literature Cited


Effect of Soil Compaction and Nitrogen Source on Growth and Yield of Squash

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Abstract. Plant and root growth and root distribution of 'Dixie' squash (Cucurbita maxima Duch.) were reduced by mechanical soil compaction of a Tifton loamy sand soil. Soil atmospheric O₂ and CO₂ concentrations were not affected by soil compaction. Marketable fruit yield was reduced 46 to 58% by increased soil strength produced by tractor wheel traffic. Nitrogen from Ca(NO₃)₂ produced greater yields in non-compacted plots and smaller yields in compacted plots than NH₄NO₃.

Many vegetable crops are considered to develop shallow root systems and may be very susceptible to soil compaction; however, the effects of implement traffic on vegetable growth and yield have not been extensively studied (2, 3, 6). Portas (6) reported that root system development of several vegetable crops was affected more by soil conditions than by inherent root growth patterns. Sweet corn yield was not affected by compaction of a Yolo loam soil, but ear and plant size were reduced by severe compaction (2). Severe compaction of a Geary silt loam soil reduced tomato root penetration, vine growth, and marketable fruit yield (3). Reduced O₂ resulting from severe compaction was indicated as a factor contributing to the shallow root system, smaller vine growth and lower yield, although O₂ levels were not determined.

Mechanical compaction by equipment traffic (5) has formed tillage pans in most Coastal Plain soils (4) and in coarse-textured soils of other areas. Tillage pans are broken by subsoiling or deeper plowing, but soil strength is often restored to its original level by pressure of the tractor wheel (8). Redistribution patterns of fertilizer salts after leaching with water reported by Rhoads (7) indicates that squash growth and yield responses from different N sources may be greatly modified by soil compaction. Our study was initiated to determine the response of 'Dixie' squash to combinations of soil compaction levels and N sources.

Materials and Methods

An immature rye cover crop grown on the area prior to initiation of the study was cut with a rotary mower. Sulfate of potash magnesia (35 kg Mg and 64 kg K/ha) were broadcast and incorporated into Tifton loamy sand soil to a depth of 10 to 15 cm. Herbicides, Bensulfide and Napthalam (4.5 kg a.i./ha...