

Effect of N Rate and Application on Spanish Peanut (*Arachis hypogaea* L.) Yield and Seed Grade, N and Oil.¹

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ABSTRACT

Due to conflicting results of previous studies, experiments were conducted to study the effect of rate and time of application of N on the yield of fruit and on seed grade, percent N and oil content of Spanish peanuts (*Arachis hypogaea* L.). Rates and times of application of N had no significant effect on yield, grade or percent N in seed of Starr peanuts grown on three different soil types. Application of 134.4 kg of N/ha to Fuquay soil 6 weeks after planting decreased oil content in the seed. When the same rate of N was split into two applications ($\frac{1}{2}$ at planting and $\frac{1}{2}$ at 6 weeks), the oil content was significantly higher than when all the N was applied 6 weeks after planting. On Tifton soil, split applications of N ($\frac{1}{2}$ at 6 weeks and $\frac{1}{2}$ at 12 weeks) tend to reduce the oil content of seeds as the N rates increased. The 134.4 kg/ha rate of N applied by this method produced a significantly lower oil content than where all the N was applied at planting or 6 weeks after planting.

Additional index words: Tifton ls, Fuquay ls, Greenville scl, Time of Application.

Several experiments (1, 2, 3, 4, 6, 10) conducted in the past have shown that Spanish peanuts (*Arachis hypogaea* L.) gave little or no response while others (7, 9) have shown a definite increase in yield due to the application of N. Walker *et al.* (11) obtained an increase in yield of Spanish peanuts from application up to 22.4 kg/ha of N. They also reported that split applications of N were better than applying all the N at planting. Similar results were reported by Gore (5) who found that $\frac{1}{4}$ of the N applied at planting and $\frac{3}{4}$ sidedressed gave almost a 448 kg/ha increase in yield over the check plot.

Because of conflicting results of previous studies experiments were conducted to study the effect of rate and time of application of N on the yield of fruit and on the grade, percent N and oil content of Spanish peanut seeds.

Experimental Procedure

Field experiments were conducted from 1968 to 1970 on different soil types at Tifton and Plains, Georgia. Soil types, location and soil test data are shown in Table 1. Soils at Tifton and Plains were limed at the rate of 2240 and 3360 kg/ha of dolomitic lime, respectively. The N treatments were 0, 22.4, 44.8, 89.0, and 134.4 kg/ha of NH_4NO_3 . The times of N application were: (a) all at planting, (b) all 6 weeks after planting, (c) $\frac{1}{2}$ at planting and $\frac{1}{2}$ 6 weeks later, and (d) $\frac{1}{2}$ 6 weeks and $\frac{1}{2}$ 12 weeks after planting. All plots received 58 kg P and 111 kg K/ha, respectively. All or part of the N was mixed with P and K for application. The fertilizer material was broadcast and plowed under approximately

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Table 1. Location, soil type and classification, and soil test pH, P, and K* levels for the experimental sites.

| Location | Soil type and classification | pH | P | K |
|----------|--|-----|---------------|-------|
| | | | --- kg/ha --- | |
| Plains | Greenville scl (clayey, kaolinitic, thermic, Rhodic Paleudult) | 5.9 | 48.2 | 331.8 |
| Tifton | Fuquay la (loamy, siliceous, thermic, Arenic Plinthic Paleudult) | 5.6 | 106.5 | 85.2 |
| Tifton | Tifton ls (fine, loamy, siliceous, thermic, Plinthic Paleudult) | 5.7 | 78.5 | 107.6 |

*Soil samples extracted with a 0.075 N acid solution (0.05 N HCl and 0.025 N H_2SO_4).

Soil pH (water pH in a 1:1 soil water ratio).

14 to 25 cm deep. The remaining N was broadcast as a sidedress at either 6 or 12 weeks after planting.

The experimental design was a split plot with six replications. The whole plot was time of application and the split plots were rates of N.

Individual plots consisted of four 81 cm rows 6.1 m long. The two inside rows were harvested for yield. The cultivar selected was Starr (*Arachis hypogaea* L.). The seeds were planted at the rate of 134.4 kg/ha. The herbicide treatments at Tifton consisted of applying 1 liter of vernolate, while at Plains the herbicide treatments were 1 liter of vernolate plus 2.27 liters of benefin. Other recommended practices for peanut production were carried out during the growing season.

Harvest rows were dug with a mechanical digger-shaker. The plants were allowed to dry and the pods (fruit) were removed from the vines with a field combine. A 454 g sample of fruit was selected from each treatment for grade determination by the Federal-State Inspection Service. Another sample of pods (fruit) was shelled and the seed ground in a Waring blender. A 5-g sample of this material was used to determine the oil content (8). The percent N was determined by a modification of Kjeldahl Gunning-Arnold method of analysis of A. O. A. C.

Results and Discussion

Rates and time of application of N had no significant effect on the yield or grade of Starr peanuts grown on three different soil types (Tables 2 & 3). However, the foliage of the peanut plants which received N was a darker green and had a much more vigorous growth than the no-N plots. These data tend to support results reported by other workers (2, 6, 10). In 1 out of 3 years, peanuts grown on Greenville soil did show a significant increase in yield due to time of application of N. However, peanuts grown on Tifton and Fuquay soils did not show a significant response. This data is contrary to that reported by Walker (11) and Gore (5) for similar soils.

The percent N in the seed of Spanish peanuts was not affected by the N rate or time of application (Table 4). The rate of N had a significant

effect on the percent N in Spanish peanut seed grown on Fuquay and Greenville soils only 1 out of 3 years.

Application of 134.4 kg of N/ha to Fuquay soil 6 weeks after planting decreased oil content in the seed (Table 5). When the same rate of N was split into two applications (½ at planting and ½ at 6 weeks), the oil content was significantly higher

Table 2. The effect of rate and time of application of N on average yield* of Spanish peanuts, 1968-1970.

| Time of application | N, kg/ha | | | | |
|-----------------------------|--|------|------|------|-------|
| | 0 | 22.4 | 44.8 | 89.0 | 134.4 |
| | ----- kg/ha ----- | | | | |
| | TIFTON, GEORGIA - FUQUAY LOAMY SAND | | | | |
| At planting | 1982 | 2105 | 2055 | 1911 | 1957 |
| 6 weeks after planting | 1966 | 1927 | 1960 | 1917 | 1966 |
| ½ at planting, ½ at 6 weeks | 2142 | 1925 | 2010 | 2094 | 2135 |
| ½ at 6 weeks, ½ at 12 weeks | 2011 | 1963 | 1797 | 1860 | 1804 |
| | TIFTON, GEORGIA - TIFTON LOAMY SAND | | | | |
| At planting | 2172 | 2306 | 2281 | 2415 | 2188 |
| 6 weeks after planting | 2276 | 2103 | 2332 | 2322 | 2283 |
| ½ at planting, ½ at 6 weeks | 2018 | 2306 | 2196 | 2098 | 2191 |
| ½ at 6 weeks, ½ at 12 weeks | 2196 | 2378 | 2374 | 2215 | 2198 |
| | PLAINS, GEORGIA - GREENVILLE SANDY CLAY LOAM | | | | |
| At planting | 3073 | 3263 | 3076 | 3097 | 3017 |
| 6 weeks after planting | 2967 | 3063 | 3244 | 3227 | 3224 |
| ½ at planting, ½ at 6 weeks | 3206 | 3214 | 3309 | 3202 | 3389 |
| ½ at 6 weeks, ½ at 12 weeks | 3224 | 3244 | 3336 | 3301 | 3299 |

* Neither time of application nor rate of N had any significant effect on yield of peanut seeds at 0.05 level.

Table 3. The effect of rate and time of application of N on average percent sound mature kernels* of Spanish peanuts, 1968-1970.

| Time of application | N, kg/ha | | | | |
|-----------------------------|--|------|------|------|-------|
| | 0 | 22.4 | 44.8 | 89.0 | 134.4 |
| | ----- % ----- | | | | |
| | TIFTON, GEORGIA - FUQUAY LOAMY SAND | | | | |
| At planting | 69.8 | 68.9 | 68.8 | 68.2 | 67.2 |
| 6 weeks after planting | 68.8 | 68.9 | 68.8 | 68.4 | 67.5 |
| ½ at planting, ½ at 6 weeks | 70.4 | 69.7 | 69.9 | 69.2 | 69.6 |
| ½ at 6 weeks, ½ at 12 weeks | 69.7 | 66.9 | 69.3 | 68.8 | 68.8 |
| | TIFTON, GEORGIA - TIFTON LOAMY SAND | | | | |
| At planting | 72.0 | 72.0 | 72.0 | 72.0 | 72.0 |
| 6 weeks after planting | 72.0 | 72.0 | 71.0 | 72.0 | 72.0 |
| ½ at planting, ½ at 6 weeks | 72.0 | 72.0 | 71.0 | 72.0 | 72.0 |
| ½ at 6 weeks, ½ at 12 weeks | 72.0 | 73.0 | 72.0 | 72.0 | 72.0 |
| | PLAINS, GEORGIA - GREENVILLE SANDY CLAY LOAM | | | | |
| At planting | 68.5 | 69.7 | 68.3 | 67.9 | 67.9 |
| 6 weeks after planting | 70.3 | 68.9 | 68.3 | 68.3 | 69.0 |
| ½ at planting, ½ at 6 weeks | 69.4 | 69.1 | 69.2 | 68.6 | 68.8 |
| ½ at 6 weeks, ½ at 12 weeks | 69.1 | 68.5 | 68.6 | 69.9 | 68.2 |

* Neither time of application nor rate of N had any significant effect on percent sound mature kernels at 0.05 level.

Table 4. The effect of rate and time of application of N on average percent N* in Spanish peanuts, 1968-1970.

| Time of application | N, kg/ha | | | | |
|-----------------------------|--|------|------|------|-------|
| | 0 | 22.4 | 44.8 | 89.0 | 134.4 |
| | ----- % ----- | | | | |
| | TIFTON, GEORGIA - FUQUAY LOAMY SAND | | | | |
| At planting | 4.33 | 4.27 | 4.27 | 4.29 | 4.41 |
| 6 weeks after planting | 4.38 | 4.32 | 4.38 | 4.31 | 4.36 |
| ½ at planting, ½ at 6 weeks | 4.31 | 4.38 | 4.30 | 4.32 | 4.30 |
| ½ at 6 weeks, ½ at 12 weeks | 4.32 | 4.37 | 4.29 | 4.33 | 4.48 |
| | TIFTON, GEORGIA - TIFTON LOAMY SAND | | | | |
| At planting | 4.48 | 4.72 | 4.40 | 4.47 | 4.50 |
| 6 weeks after planting | 4.56 | 4.56 | 4.50 | 4.54 | 4.54 |
| ½ at planting, ½ at 6 weeks | 4.56 | 4.62 | 4.47 | 4.48 | 4.40 |
| ½ at 6 weeks, ½ at 12 weeks | 4.57 | 4.62 | 4.55 | 4.52 | 4.53 |
| | PLAINS, GEORGIA - GREENVILLE SANDY CLAY LOAM | | | | |
| At planting | 4.60 | 4.53 | 4.57 | 4.51 | 4.58 |
| 6 weeks after planting | 4.56 | 4.56 | 4.50 | 4.54 | 4.54 |
| ½ at planting, ½ at 6 weeks | 4.56 | 4.62 | 4.47 | 4.48 | 4.40 |
| ½ at 6 weeks, ½ at 12 weeks | 4.57 | 4.62 | 4.55 | 4.52 | 4.53 |

* Neither time of application nor rate of N had any significant effect on percent N in Spanish peanut seeds at 0.05 level.

Table 5. The effect of rate and time of application of N on average percent oil of Spanish peanuts, 1968-1970.

| Time of application | N, kg/ha | | | | |
|-----------------------------|--|---------|---------|---------|----------|
| | 0 | 22.4 | 44.8 | 89.0 | 134.4 |
| | ----- % ----- | | | | |
| | TIFTON, GEORGIA - FUQUAY LOAMY SAND | | | | |
| At planting | 43.27 a | 44.14 a | 44.10 a | 43.52 a | 43.42ab* |
| 6 weeks after planting | 44.12 a | 43.94 a | 44.18 a | 43.45 a | 42.57 b |
| ½ at planting, ½ at 6 weeks | 43.84 a | 43.40 a | 43.99 a | 43.34 a | 43.76a |
| ½ at 6 weeks, ½ at 12 weeks | 43.69 a | 43.81 a | 43.81 a | 43.62 a | 43.32ab |
| | TIFTON, GEORGIA - TIFTON LOAMY SAND | | | | |
| At planting | 44.26 ab | 44.10 a | 43.98 a | 44.48 a | 44.22a* |
| 6 weeks after planting | 43.89 b | 44.14 a | 44.61 a | 44.37 a | 44.22a |
| ½ at planting, ½ at 6 weeks | 45.72 a | 44.04 a | 44.93 a | 44.16 a | 43.51ab |
| ½ at 6 weeks, ½ at 12 weeks | 44.05 ab | 43.99 a | 43.96 a | 43.36 a | 41.98 b |
| | PLAINS, GEORGIA - GREENVILLE SANDY CLAY LOAM | | | | |
| At planting | 44.85 a | 44.90 a | 44.62 a | 44.91 a | 44.59a* |
| 6 weeks after planting | 44.63 a | 44.80 a | 44.25 a | 44.79 a | 45.14a |
| ½ at planting, ½ at 6 weeks | 44.76 a | 44.78 a | 44.62 a | 42.79 a | 44.10a |
| ½ at 6 weeks, ½ at 12 weeks | 45.10 a | 44.94 a | 44.36 a | 44.49 a | 42.51a |

*N rate data connected by lines are not significantly different and time of application data having common letters within columns are not significantly different at (P = 0.05) level.

than when all the N was applied 6 weeks after planting.

On the Tifton soil, split-applications of N (½ at 6 weeks and ½ at 12 weeks) tend to reduce the oil content of seeds as the N rates increased. The

134.4-kg/ha rate of N applied by this method produced a significantly lower oil content than where all of the N was applied at planting or 6 weeks after planting.

Summary and Conclusion

Experiments were conducted on three different soil types to study the effect of rate and time of application of N on the yield of fruit, and the grade, percent N and oil content of Spanish peanut seeds.

Rate and time of application of N had no significant effect on yield, grade or percent N. The percent oil was reduced significantly at the highest N level when applied 6 weeks after planting on Fuquay soil, while on the Tifton soil increased rates of a late split-application of N reduced the oil content of peanuts. From this data it appears that the addition of N to peanut fertilizer is a questionable practice on these soils and is not beneficial and should be deleted from the suggested practices.

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