EFFECT OF POTASSIUM FERTILIZER UNDER TWO PLANTING DATES ON YIELD AND YIELD COMPONENTS OF GIZA 80 COTTON CULTIVAR

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ABSTRACT

Two field experiments were carried out at Sids Agriculture Research Station, during 2005 and 2006 seasons, to study the effect of two planting dates: 15th March and 15th April and three treatments of potassium fertilizer I. 24 kg K₂O/fed as soil application, II. 24 kg K₂O/fed as soil application + 2.4 kg K₂O/fed as foliar spraying at flowering stage, III. 2.4 kg K₂O/fed spraying at squaring + 2.4 kg K₂O/fed foliar spraying at flowering stage, on yield and yield components of Giza 80 cotton cultivar.

Results revealed that the early planting date (15th March) significantly increased boll weight, seed index and lint percentage in the second season. While number of open bolls/plant in the first season and seed cotton yield/feddan in the two seasons were significantly increased by late planting date on (15th April). On the other hand, number of fruiting branches/plant, seed cotton yield/plant and earliness % showed insignificant effect.

Potassium fertilizer significantly affected number of fruiting branches/plant in the first season, no. of open bolls/plant, in the second season. While, seed cotton yield/plant, earliness % and lint % were insignificantly affected. However, seed cotton yield/fed was significantly affected by potassium fertilizer in both seasons.

The interaction between planting date and potassium fertilizer treatments significantly affected the number of fruiting branches/plant and earliness in the first season. However, boll weight, seed cotton yield/fed and seed index were significantly affected in both seasons. While no. of open bolls/plant and lint percentage were significantly affected only in 2006 season.

Key Words: G. barbadense, L., planting date, potassium fertilizer, yield components, interaction.

INTRODUCTION

Planting date is considered the most important factor among different factors, influencing growth and yield of cotton. In Egypt, many investigations showed that early planting had favorable effect on seed cotton compared with late sowing. Many workers studied the effect of planting date on cotton plant viz.

Abd El-zaher (1995) and El-Debabi et al. (1995) they found that no. of open bolls/plant, boll weight, seed cotton yield and earliness increased with early planting, Assyi and Abd El-Malak (1997) reported that early planting date increased seed cotton yield/plant, seed index and lint percentage, El-Shahawy (1999) found that early planting date increased no. of open bolls/plant, boll weight, lint percentage, seed index and seed cotton yield, El-Tabbakh (2001) found that the late sowing of 1st may significantly decreased no. of total bolls/plant, seed cotton yield/plant and/fed and earliness%. However delaying planting showed significantly increased lint percentage and seed index, Kassem (1999) and Ali and El-Sayed (2001) they found that seed cotton
yield and its components increased with early planting. Regarding the growth of cotton plant, El-Sayed and El-Menshawi(2006) mentioned that number of fruiting branches/plant, number of open bolls/plant, boll weight, lint percentage and seed index gradually decreased from early to late sowing. Killi (2005) reported that delaying sowing date lower no. of fruiting branches, no. of open bolls/plant, seed cotton yield and lint percentage compared to normal planting.

Potassium is one of the most important elements in plant nutrition. Its effect on enzyme activation, water relations, energy relations, translocation of assimilates nitrogen uptake and protein and starch synthesis was demonstrated by many workers, Makram and El-Shinawy (1995) and El-Tabbish (2002) mentioned that lint percentage, seed index and its components increased with potassium spraying as 1 % K₂O/fed at the start flowering by two weeks, Abd El-Shafy et al. (2001) reported that most of yield components of cotton plant i.e. no. of open bolls/plant, boll weight and earliness % were increased with application K₂O as soil after thinning. Pervez et al. (2002), Aneela and Ashraf (2003) and Kasem and Ahmed(2005) found that no. of open bolls/plant, boll weight and seed cotton yield were increased with application of potassium fertilizer at 48 kg/fed and Sharma and Singh(2007) showed that foliar application of potassium fertilizer 2% K₂O at 15 kg/fed increased no. of open bolls/plant, boll weight and seed cotton yield by foliar application of K₂O.

The aim of this investigation was to study the effect of two planting dates and three potassium fertilizer treatments on yield and yield components of Giza 80 cotton cultivar.

MATERIALS AND METHODS

Two field experiments were conducted at Sids Agriculture Research Station (Beni-Suef Governorate) in two successive seasons (2003 and 2006), to study the effect of planting dates and potassium fertilizer on yield and its components of Giza 80 cotton cultivar. The experimental soil was clay loam with pH (7.88 and 8.00) organic matter (1.27 and 1.50 %), Ca CO₃ (3.2 and 2.58 %), E.C. (0.56 and 0.80 ds/m) available nutrient N (59.0 and 47.0 ppm), P (11.0 and 7.0 ppm), K (475 and 390 ppm), Ca (3.20 and 3.00 %) and Mg (3.70 and 3.60 %) in both seasons, respectively. The precedent crop was clover in both seasons. The experimental design was split plot with four replications. The main plots were devoted to the planting dates, while the potassium fertilizer treatments were randomly distributed in the sub-plots.

Experimental factors:

a. Planting dates:
   1. Early planting (March 15th).
   2. Late planting (April 15th).

b. Potassium fertilizer treatments:
   1. 24 kg K₂O/fed as soil application after thinning.
   2. 24 kg K₂O/fed as soil application after thinning plus 2.4 kg K₂O/fed as foliar application at flowering stage.
   3. 2.4 kg K₂O/fed at squaring stage and 2.4 kg K₂O/fed application at flowering stage as foliar.

All normal cultural practices except the studied factors were followed as recommended for cotton production. In order to estimate the following characters, five plants were chosen randomly from each plot at harvest:

1. Number of fruiting branches/plant.
2. Number of open bolls/plant.
3. Boll weight (g): as the average weight of 25 bolls.
4. Seed cotton yield/plant (g).
5. Seed cotton yield/fed (kg) based on subplot yield converted/fed equivalent.
6. Lint percentage.
7. Seed index (g) (wt g/100 seeds).
8. Earliness percentage = (yield of first pick/total yield) x 100.

The obtained results were subjected to the statistical analysis as described by Snedecor and Cochran (1981) and the difference between treatments was compared by using the least significant differences at 5 % level.
RESULTS AND DISCUSSION

A. Effect of planting dates:

Results in Tables (1) and (2) revealed that the number of fruiting branches/plant was not significantly affected by planting date in both seasons. While the number of open bolls/plant was affected by planting with the difference between means being in favor of late planting date (15th April) in the first season only.

Boll weight (g) was significantly affected by planting date in the second season Early planting (15th March) gave rather heavier bolls compared to late planting (15th April). Results also show that seed cotton yield/plant was not affected by planting date. However, seed cotton yield/fed was significantly affected by planting date in both seasons. Late planting (15 April) gave better yield of seed cotton compared with early planting (15 March). This result could be attributed to better environmental conditions that led to greater no. of open bolls/plant, thus better seed cotton yield/fed with regard to lint percentage, results show that it was affected by planting date in the second season with the differences between means being in favor of early planting date (15th March).

Seed index was significantly affected by planting date. However, a higher seed index was observed with early planting (full season) in 2006 season only. The results is also attributed to the heavier boll weight observed for early planting.

Earliness percentage was not significantly affected by planting date. However, higher earliness percentage was observed with early planting (full season) the result is also attributed heavier earliness observed for early planting. These results disagree with those reported by Abdel zahar (1995), El-Debaby et al. (1995) and Assy and Abd El- Malak (1997).

Table (1): Effect of planting dates and potassium fertilizer on no. of fruiting branches/plant, no. of open bolls/plant, boll weight and seed cotton yield/plant of Giza 80 cotton cultivar in 2005 and 2006 seasons.

<table>
<thead>
<tr>
<th>Planting dates (A)</th>
<th>Potassium fertilizer (K₂O/field) (B)</th>
<th>No. of fruiting branches/plant</th>
<th>No. of open bolls/plant</th>
<th>Boll weight (g)</th>
<th>Seed cotton yield/plant (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 March</td>
<td>I</td>
<td>14.42</td>
<td>14.78</td>
<td>11.14</td>
<td>11.69</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>14.70</td>
<td>15.19</td>
<td>12.17</td>
<td>11.96</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>14.96</td>
<td>15.29</td>
<td>13.41</td>
<td>11.54</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>14.69</td>
<td>15.09</td>
<td>12.24</td>
<td>11.73</td>
</tr>
<tr>
<td>15 April</td>
<td>I</td>
<td>14.54</td>
<td>14.83</td>
<td>13.21</td>
<td>12.20</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>14.79</td>
<td>15.08</td>
<td>13.50</td>
<td>13.50</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>16.02</td>
<td>15.02</td>
<td>13.81</td>
<td>13.81</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>15.12</td>
<td>14.98</td>
<td>13.51</td>
<td>13.17</td>
</tr>
<tr>
<td>Mean of potassium fertilizer</td>
<td>I</td>
<td>14.48</td>
<td>14.81</td>
<td>12.18</td>
<td>11.95</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>14.75</td>
<td>15.14</td>
<td>12.89</td>
<td>12.73</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>15.49</td>
<td>15.16</td>
<td>13.61</td>
<td>12.68</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>15.12</td>
<td>14.98</td>
<td>13.51</td>
<td>13.17</td>
</tr>
<tr>
<td>L.S.D. at 0.05</td>
<td></td>
<td></td>
<td></td>
<td>2.54</td>
<td>3.04</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planting dates (A)</th>
<th>N.S.</th>
<th>N.S.</th>
<th>1.24</th>
<th>N.S.</th>
<th>0.08</th>
<th>N.S.</th>
<th>N.S.</th>
<th>N.S.</th>
<th>N.S.</th>
<th>N.S.</th>
<th>N.S.</th>
<th>N.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium fertilizer (B)</td>
<td>0.31</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A X B</td>
<td>0.44</td>
<td>N.S.</td>
<td>N.S.</td>
<td>2.03</td>
<td>0.16</td>
<td>0.24</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
</tr>
</tbody>
</table>

I. 24 kg after thinning.
II. 24 kg after thinning + 2.4 kg spray at flowering stage.
III. 2.4 kg spray at squaring stage + 2.4 kg spray at flowering stage.
Table (2): Effect of planting dates and potassium fertilizer on seed cotton yield/fed, lint percentage, seed index and earliness percentage of Giza 80 cotton cultivar in 2005 and 2006 seasons.

<table>
<thead>
<tr>
<th>Planting dates (A)</th>
<th>Potassium fertilizer (kg K₂O/fed) (B)</th>
<th>Seed cotton yield (kg)</th>
<th>Lint %</th>
<th>Seed index (g)</th>
<th>Earliness %</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 March</td>
<td>I</td>
<td>1253.35</td>
<td>1301.35</td>
<td>41.98</td>
<td>39.59</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>12.96.19</td>
<td>1357.26</td>
<td>41.27</td>
<td>39.81</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>1334.76</td>
<td>1418.69</td>
<td>42.27</td>
<td>39.89</td>
</tr>
<tr>
<td>Mean</td>
<td>1294.76</td>
<td>1359.10</td>
<td>41.84</td>
<td>39.76</td>
<td>9.69</td>
</tr>
<tr>
<td>15 April</td>
<td>I</td>
<td>1305.37</td>
<td>1349.87</td>
<td>41.40</td>
<td>37.80</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>1313.76</td>
<td>1387.26</td>
<td>41.33</td>
<td>38.56</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>1596.61</td>
<td>1609.26</td>
<td>41.50</td>
<td>38.57</td>
</tr>
<tr>
<td>Mean</td>
<td>1405.25</td>
<td>1448.80</td>
<td>41.41</td>
<td>38.31</td>
<td>9.62</td>
</tr>
<tr>
<td>Mean of potassium</td>
<td>I</td>
<td>1279.40</td>
<td>1325.61</td>
<td>41.69</td>
<td>38.70</td>
</tr>
<tr>
<td>fertilizer</td>
<td>II</td>
<td>1304.97</td>
<td>1372.26</td>
<td>41.30</td>
<td>39.18</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>1465.68</td>
<td>1513.97</td>
<td>41.89</td>
<td>39.23</td>
</tr>
<tr>
<td>L.S.D. at 0.05</td>
<td>50.17</td>
<td>66.53</td>
<td>N.S.</td>
<td>1.44</td>
<td>N.S.</td>
</tr>
<tr>
<td></td>
<td>61.47</td>
<td>81.47</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
</tr>
<tr>
<td></td>
<td>86.92</td>
<td>115.23</td>
<td>N.S.</td>
<td>1.33</td>
<td>0.24</td>
</tr>
</tbody>
</table>

1. 24 kg after thinning.
2. 24 kg after thinning + 2.4 kg spray at flowering stage.
3. 2.4 kg spray at squaring stage + 2.4 kg spray at flowering stage.

B. Effect of potassium fertilizer:
With respect to the effect of potassium fertilizer on yield and yield components, results in Tables (1 and 2) show that the number of fruiting branches/plant was significantly affected by potassium fertilizer as could be detected in the first season only. Higher values are concomitant with third treatment (2.4kg at squaring + 2.4kg at flowering) while number of open bolls/ plant was not affected by potassium fertilizer in both seasons.

Boll weight and seed cotton yield/plant were insignificant affected by potassium fertilizer in both seasons.

Concerning potassium application results in Table (2) show that this factor had significant effect on seed cotton yield/fed in both Seasons. Higher seed cotton yield was recorded for treatments III. 465.68 and 151.97 kg/fed. II. While there were insignificant differences between treatments on lint percentage were detected seed index and earliness percentage by potassium addition in both seasons. Similar results were obtained by Pervez et al. (2002) and Sharma and Singh (2007).

C. Interaction between planting dates and potassium fertilizer treatment:
Regarding the effect of the interaction between planting dates and potassium fertilizer, from the results in Tables (1 and 2) it is evident that higher values of fruiting branches/plant were associated with treatment III where all potassium was given in the form of foliar spraying in both seasons. While number of open bolls/plant was significant in the second season. It is also clear that treatment late planting and treatment and III gave better effect than other interactions.

Boll weight was significantly affected by planting date x potassium fertilizer in both seasons. Seed cotton yield/plant was not affected by interaction planting date x potassium fertilizer, with the highest cotton seed/plant being obtained from treatment 15th April.
III. The interaction of planting date x potassium fertilizer significantly affected seed cotton yield/ fed in both seasons. Late planting (15 April) and treatment III gave the highest yield.

The interaction of planting date x potassium fertilizer significantly affected lint percentage in the second season, early planting (15 March) and treatment III gave the better lint %. Seed index was affected by the interaction of planting date x potassium fertilizer in both season, early planting (15 March) and treatment III gave the higher seed index. The interaction of planting date x potassium fertilizer significantly affected earliness percentage in the first season.

CONCLUSION

It's evident from the result obtained that the no. of fruiting branches/plant and earliness % characters are not prone to be altered by planting dates. Also as seed cotton yield/plant concern us most, its clear that better seed cotton yield/fed, for this particular cultivar (Giza 80) could be achieved by April 15 (late planting) in order to ensure higher no. of open bolls/plant and higher seed cotton yield/plant (shorter growing season). Or, through up grading the two minor entities of seed cotton yield, namely lint % and seed index by early planting on 15th March (full season). The first Approach is more appropriate and manageable than the second one.

Application of potassium treatments indicated the presence of some stimulatory effects on of fruiting branches/plant, plant height, seed cotton yield/ fed, yet results are irresolute.

With regard to the interaction of planting date x potassium fertilizer it was apparent that of all treatment. The third rate of 2.4 kg K2O/fed as foliar application at squaring stage + 2.4 kg K2O/fed as foliar application at flowering stage seems the best treatments under the late time of planting (15 April). and, it seems to be a suitable procedure of cotton growing under the conditions of the experiment at Sids.

REFERENCES


تأثير السامد البوناني تحت موطئين للزراعة على المحصول ومكوناته لمنصفي القطن جزء ٨٠

جابر عبد الطيف ساري، أحمد رشدي محمد، أسماء محمد محمد وصالح شعبان عبد الجيد

* ميد المحصولـ كلية الزراعة المشهورة ـ جامعة بنها.
** ميد بحوث القطن مركز بحوث القطن الزراعية.

أعمال تجريبية قليلات بمحاربة البذورية لميدة بحوث القتين الزراعية ببنها ـ محافظة ميسيوط في موسم ٢٠٠٠/٢٠٠١، بذل دراسة تأثير مويعي للزراعة (٠٥ فبراير - ٣١ أكتوبر)، مع ثلاثة
متعالتين من السامد البوناني (٣٠ كجم/كلن لإدارة إضافية أرضية بعد الة قبل و ٢٤ كجم/كلن لإدارة أرضية بعد
اللوح + ٣٠٦ كجم/كلن رشا في بداية الفصول و ٣٠٦ كجم/كلن رشا في بداية الفصول و ٣٠٦ كجم/كلن رشا
في بداية الفصول).

أوضح النتائج أن الزراعة الممتصة (١٥ فبراير) أدت إلى زيادة مثمرة في كل من مستويات زمن
اللوح، ومعالجة البذور، وتفصيل الجلخ، بينما أدت الزراعة الممتصة (٠٢ أكتوبر) إلى زيادة عدد اللوح
الممتصة، ومحصول القطن الزراعي/كلن، بينما لم تتأثر معنويًا كلاً من عدد الأفرع الفرعية والبكر، ومحصول القطن الزراعي/كلن، والبنية المحمية لللؤلؤ.

كما أوضحت النتائج أيضًا أن السامد البوناني له تأثير إيجابي على عدد الأفرع الفرعية/البكر
وعدد الأفرع الفرعية/البكر في موسم واحد من الزراعة، بينما لم تتأثر معنويًا كلاً من مساحة القطن
الزراعي/كلن، والبنية المحمية لللؤلؤ، ومحصول القطن الزراعي/كلن في موسم واحد.

وأوضح النتائج أن التفاعل بين مويعي الزراعة ومعالجات البوناني كان معنويًا على عدد
الافرع الفرعية/البكر، واللوح الممتص، ونسبة البذور الممتصة، ونسبة البذور الممتصة في موسم واحد، و
في حجم ثابت كل من وزن اللؤلؤ وإنتاج اللؤلؤ، ومحصول القطن الزراعي/كلن معنويًا لتلك المويع.

الخضوع:

المحصول على كل لؤلؤ النتائج كما جاء في البحث يعول رعية منفيف القطن جزء ٨٠

حيد من مثمرات شامل مórioت السامد البوناني بكم ١٠٢٠ كجم/كلن رشا عند بداية الفصول، و
٣٠٦ كجم/كلن رشا عند بداية الفصول.