Effects of rational K application on vegetable yield and quality

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1. Significance and research background of rational K application on vegetable
2. Rational K application and vegetable yield
3. Rational K application and Vc content in vegetable
4. Rational K application and sugar content in vegetable
5. Effects of different kind K fertilizers on potato yield and quality
6. Effects of rational K application on control of nitrate content in leaf vegetable
7. Conclusions
1 Significance of rational K application on vegetable

◆ At the same time of resolving the food gross, the quality of important food like vegetable arouses more and more social attention.

◆ Although K is not the composing element of plants, K takes part in many metabolize in plants. K plays the role of activation in the forming progresses of protein and nucleic acid.

◆ K plays many important roles such as improving crop yield, quality and resistance, and so on.

◆ K is named “quality element”.
Research background

◆ Purpose: to make regulations of fertilization technique about no social effects of pollution vegetable

◆ Test time: 2002--2005

◆ Test magnitude: more than 10 field tests

◆ Test content: relationship of vegetable yield and quality and K rate and varieties.

◆ To research effects of rational K application on vegetable yield and quality on the basis of using N and P.
2 Effects of rational K application on vegetable yield

- Effects of K application with N and P on:
  - Cabbage yield
  - K application and balsam pear yield
  - K application and bean yield
  - K application and eggplant yield
  - K application and winter potato yield
2.1 K application rate and cabbage yield

The quadratic regression relationship of K rate and cabbage yield indicates that more than appropriate K application will reduce vegetable yield.

\[ Y = 993 + 147X - 7.4K^2 \] (r=0.950)
2.2 K application rate and balsam pear yield

\[ Y = 868.8 + 130K - 4.6K^2 \]

"The same effects with cabbage"
2.3 K application rate and bean yield

The same effects with cabbage

\[ Y = 1468 + 7.5K - 0.32K^2 (r=0.984) \]
2.4 K application rate and eggplant yield

The same effects with cabbage
2.5 K application rate and winter potato yield

\[ Y = 527.886 + 54.4183X - 1.4223X^2 \ (R^2 = 0.857) \]

The same effects with cabbage
3 Effects of rational K application rate on Vc content in vegetable

- Effects of K application with N and P on
  - K application rate and Vc content in cabbage
  - K application rate and Vc content in balsam pear
  - K application rate and Vc content in bean
  - K application rate and Vc content in eggplant
  - K application rate and Vc content in winter potato
3.1 K application rate and Vc content in cabbage

To apply appropriate K fertilizer can get the highest Vc content in vegetable on the basis of using N and P.
3.2 K application rate and Vc content in balsam pear

- There is an appropriate K rate for the Vc content in balsam pear.

\[ y = 916 - 51.9P + 11.6P^2 - 0.48P^3 \]
3.3 K application rate and Vc content in bean

![Graph showing Vc content of bean in sand soil (mg/kg) against K₂O (kg/0.0667hm²)]

\[ Y = 187.5 - 6.17K + 0.799K^2 - 0.022K^3 \quad (r = 0.999) \]

- Bean has the same effects with balsam pear.
3.4 K application rate and Vc content in eggplant

- Eggplant has the same effects with balsam pear.
3.5 K application rate and Vc content in potato

Potato has the same effects with balsam pear.
4 Effects of rational K application on sugar content in vegetable

- Effects of K application with N and P on
  - K application and sugar content in cabbage
  - K application and sugar content in balsam pear
  - K f application and sugar content in bean
  - K application and sugar content in eggplant
  - K application and sugar content in winter potato
4.1 K application rate and sugar content in cabbage

- Appropriate K rate can get the highest sugar content in cabbage at the same time using N and P, but over K rate reduce the sugar in cabbage.

\[ Y = 124.4 + 8.34K - 0.47K^2 \] (0.998**)
4.2 K application rate and sugar content in balsam pear

Appropriate K application can adjust the sugar content in balsam pear.

\[ Y = 83 + 9.6X - 0.93K^2 + 0.025K^3 \ (r = 0.999**) \]
4.3 K application rate and sugar content in bean

More sugar in bean need more than 13kg/mu K.
4.4 K application rate and sugar content in eggplant

![Graph showing the relationship between K application rate and sugar content in eggplant.]

\[ Y = 30.1597 + 0.1581X - 0.0036X^2 \ (R^2 = 0.250) \]

- There may be an appropriate point between K application and sugar content in eggplant.
4.5 K application rate and sugar content in potato

- Appropriate proportional NPK can control deoxidize sugar content in potato, and so can some K range.

Y = 1.8682 - 0.046X + 0.0015X² (R² = 0.888)

K₂O (kg/0.0667 hm²)
5 Effects of different kind K fertilizer to winter potato yield and quality

<table>
<thead>
<tr>
<th>K</th>
<th>Yield (kg/mu)</th>
<th>Dried matter(%)</th>
<th>Vc (mg/kg)</th>
<th>Sugar (g/kg)</th>
<th>Starch (g/kg)</th>
<th>protein (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No K</td>
<td>817.5b</td>
<td>19.65a</td>
<td>102.8bc</td>
<td>1.88a</td>
<td>149.8a</td>
<td>10.22a</td>
</tr>
<tr>
<td>KCl</td>
<td>976.4a</td>
<td>19.11a</td>
<td>170.1ab</td>
<td>1.50a</td>
<td>153.6a</td>
<td>9.71a</td>
</tr>
<tr>
<td>K₂SO₄</td>
<td>970.5a</td>
<td>18.23a</td>
<td>225.2a</td>
<td>1.51a</td>
<td>149.8a</td>
<td>9.38a</td>
</tr>
<tr>
<td>KCl + K₂SO₄</td>
<td>861.6ab</td>
<td>19.71a</td>
<td>208.4a</td>
<td>1.18a</td>
<td>162.3a</td>
<td>9.92a</td>
</tr>
</tbody>
</table>

- Differences of potato yield, dried matter, Vc, deoxidize sugar and starch between different kind K fertilizer are not significant.
6 Effects of K application on control of nitrate content in leaf vegetable

- K application in some range with N and P can control nitrate content in cabbage.
7 Conclusions

- 7.1 Vegetable yield and quality and K fertilizer rate
- 7.2 Rational K application on cabbage
- 7.3 Rational K application on balsam pear
- 7.4 Rational K application on bean
- 7.5 Rational K application on eggplant
- 7.6 Rational K application on potato
Vegetable yield and quality and K rate

- Application of K with N and P can improve vegetable yield and quality.
- There is a quadratic regression relationship between K amount and vegetable yield, the appropriate K fertilizer application can get the highest quantity.
- More Vc and sugar content in vegetable need more K₂O amount.
Vegetable yield and quality and K rate

- Nitrate content in leaf vegetable and K rate have relationship of cubic regression, and there is the most appropriate K rate for the least nitrate content.

- Sugar content in potato and K rate have relationship of inverted quadratic regression, and there is the most appropriate K rate for the least sugar content.
Rational rate of K on cabbage

- Cabbage yield: 2000kg/0.0667hm²
- Organic Matter: 200-300kg/0.0667hm²
- N: 5-10 kg/0.0667hm²
- P₂O₅: 2.4 kg/0.0667hm²
- Appropriate K₂O rate: 6-8kg/0.0667hm²
Rational rate of K on balsam pear

◆ Balsam pear yield at following fertilizer

1200-1500 kg/0.0667hm²

◆ Organic Matter 300 kg/0.0667hm²

◆ N 5-8kg/0.0667hm²

◆ P₂O₅ 3kg/0.0667hm²

◆ Appropriate K₂O rate 3-5kg/0.0667hm²

◆ N:P:K 1: 0.44: 0.91
Rational rate of K on bean

- Bean yield at following fertilizer:
  - 1000-1500 kg/0.0667hm$^2$
- Organic Matter:
  - 200-300 kg/0.0667hm$^2$
- N:
  - 5-8kg/0.0667hm$^2$
- P$_2$O$_5$:
  - 2-3kg/0.0667hm$^2$
- Appropriate K$_2$O rate:
  - 5-6.5kg/0.0667hm$^2$
- N:P:K:
  - 1:0.70:1.20
### Rational rate of K on eggplant

- **Eggplant yield at following fertilizer**: 2000 kg/0.0667 hm²
- **Organic Matter**: 800 kg/0.0667 hm²
- **N**: 22 kg/0.0667 hm²
- **P₂O₅**: 10 kg/0.0667 hm²
- **Appropriate K₂O rate**: 18 kg/0.0667 hm²
Rational rate of K on winter potato

◆ Winter potato yield at following fertilizer 1100kg/0.0667hm²
◆ Organic Matter 400-550 kg/0.0667hm²
◆ N 12-16 kg/0.0667hm²
◆ P₂O₅ 3.5-5.2 kg/0.0667hm²
◆ Appropriate K₂O rate 10-15kg/0.0667hm²
Thank you!