Effect of naturally occurring amino acid stimulants on the growth and yield of chilli (*Capsicum annum* L.)

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INTRODUCTION

- Chilli (*Capsicum annum* L.): important solanaceous crop
- Appreciated for the pungency, colour and aroma as well as for its high phytochemical content

**Year 2006**
- Local chilli production: 1512 t
- Additional import: 181 t
- Volume of processed chilli products imported: 400 t
- Import value: Rs 8 M
SIGNIFICANCE OF STUDY

- Address food insecurity by increasing local production
- Achieve 70% sufficiency by year 2015 (3350 t)
- Achieve maximum yield per unit area per unit farm input
- Scarcity of fertile agricultural land

Application of amino acid stimulants to boost chilli production

OBJECTIVES

- To identify the plant growth parameters that are affected by the application of amino acid stimulants
- To evaluate the effect of two commercial formulations of amino acid stimulants on the growth and development of the chilli plant
- To determine the increase in yield through the application of the amino acid stimulants
- To recommend the optimum product formulation in achieving highest growth and marketable yield
**METHODOLOGY**

Randomised block design with 4 blocks each consisting of 5 treatments

- **Crop grown:** Hot pepper
- **Variety:** F1 Asha Jyothi Hybrid

- Seed sown & seedlings were transplanted

- Planting-out procedures according to ‘Le Guide Agricole’

- Statistical analysis of data (Minitab Version 13.0)

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**METHODOLOGY**

- Applied along with 1st and 2nd fertiliser application
  - 0.27 g/plant (25% below recommended dosage)
  - 0.45 g/plant (25% above recommended dosage)

- Applied at flowering and fruit formation stage
  - 1 ml/L of water (25% below recommended dosage) per plant
  - 1.6 ml/L of water (25% above recommended dosage)

**Plate 1:** Perfectose™ powder

**Plate 2:** Perfectose™ liquid
METHODOLOGY

Parameters assessed:

1. Plant height
2. Canopy diameter
3. No. of branches
4. Shoot dry matter
5. Length of fruits
6. Diameter of fruits
7. % fruit dry matter
8. Ascorbic acid content
9. Marketable yield

- Plant height, canopy diameter & number of branches as per Abou Dahab and Abd El-Aziz (2006)
- Fruit size and marketable yield determined as per Berke and Gniffke (2006)
- Shoot dry matter and % fruit dry matter calculated by drying in oven at 70°C to constant weight
- Ascorbic acid content analysis followed AOAC Official Method 967.21
RESULTS & DISCUSSION

1 Effect of Perfectose™ powder on PLANT HEIGHT

![Graph showing the effect of Perfectose™ powder on plant height. The x-axis represents Days After Transplantation (DAT), and the y-axis represents Mean plant height (cm).]

RESULTS & DISCUSSION

1 Effect of Perfectose™ liquid on PLANT HEIGHT

![Graph showing the effect of Perfectose™ liquid on plant height. The x-axis represents Time (DAT), and the y-axis represents Mean plant height (cm).]
**RESULTS & DISCUSSION**

2 Effect of Perfectose™ powder on CANOPY DIAMETER

```
<table>
<thead>
<tr>
<th>Time (DAT)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean canopy diameter (cm)</td>
<td>5</td>
<td>15</td>
<td>25</td>
<td>35</td>
<td>45</td>
<td>55</td>
<td>65</td>
</tr>
</tbody>
</table>
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Perfectose powder + 25%: ▲
Perfectose powder -25%: ▲
control: ●

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2 Effect of Perfectose™ liquid on CANOPY DIAMETER

```
<table>
<thead>
<tr>
<th>Time (DAT)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean canopy diameter (cm)</td>
<td>5</td>
<td>15</td>
<td>25</td>
<td>35</td>
<td>45</td>
<td>55</td>
<td>65</td>
</tr>
</tbody>
</table>
```

Perfectose liquid + 25%: ▲
Perfectose liquid -25%: ▲
control: ●
RESULTS & DISCUSSION

3 NUMBER OF BRANCHES

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Day 10</th>
<th>Day 20</th>
<th>Day 30</th>
<th>Day 40</th>
<th>Day 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perfectose (P)+25%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perfectose (P)-25%</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perfectose (L)+25%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perfectose (L)-25%</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

DISCUSSION: VEGETATIVE PARAMETERS

- Amino acids present in Perfectose™ powder and liquid enhanced plant height, canopy diameter and number of branches.
- Amino acids as organic nitrogenous compounds are the building blocks in the synthesis of proteins (Davies, 1982).
- Results consistent with Abou Dahab and Abd El-Aziz (2006) who found that amino acid application was an effective treatment in causing significant increase in the length of *Philodendron erubescens* plants.
- Studies conducted at the University of Maharashtra have shown that Perfectose™ was effective in increasing growth of green chillies.
RESULTS & DISCUSSION

**SHOOT DRY MATTER CONTENT**

![Bar chart showing shoot dry matter content for different treatments over two days.](chart.png)

**DISCUSSION: SHOOT DRY MATTER**

- Highest shoot dry matter content with Perfectose™ powder (+25%) may be attributed to the fact this treatment gave the tallest plants, the largest canopy diameter and the highest number of branches.
- A higher assimilate supply (Heuvelink and Marcelis, 1996).
- Increase in photosynthetic pigments & chlorophyll content.
RESULTS & DISCUSSION

5 LENGTH OF FRUITS
- Significant increase in fruit length with Perfectose™ powder at both levels
- Longest fruits (18.7 cm) obtained with Perfectose™ powder (+25%)

6 DIAMETER OF FRUITS
- Biggest mean fruit diameter (12.3 mm) with Perfectose™ powder (+25%)

7 % FRUIT DRY MATTER CONTENT
- Perfectose™ powder (+25%): Highest % dry matter in fruits
- Significant influence of Perfectose™ powder (-25%)
- 31.8% increase in fruit dry matter
DISCUSSION: FRUIT CHARACTERISTICS

- Ho (1996) had found that rate of fruit expansion is affected by assimilate supply.
- Provision of amino acids for the utilisation of sugars in growing sinks (Paul and Foyer, 2001) led to highest % fruit dry matter content.

RESULTS & DISCUSSION

**ASCORBIC ACID CONTENT**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Ascorbic acid content (mg 100mg⁻¹ FW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.15</td>
</tr>
<tr>
<td>Perfectose (P)+25%</td>
<td>0.20</td>
</tr>
<tr>
<td>Perfectose (P)-25%</td>
<td>0.15</td>
</tr>
<tr>
<td>Perfectose (L)+25%</td>
<td>0.20</td>
</tr>
<tr>
<td>Perfectose (L)-25%</td>
<td>0.15</td>
</tr>
</tbody>
</table>
RESULTS & DISCUSSION

MARKETABLE YIELD

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Total marketable yield (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>10.13 c</td>
</tr>
<tr>
<td>Perfectose powder +25%</td>
<td>17.82 a S</td>
</tr>
<tr>
<td>Perfectose powder -25%</td>
<td>15.03 b S</td>
</tr>
<tr>
<td>Perfectose liquid +25%</td>
<td>12.13b c S</td>
</tr>
<tr>
<td>Perfectose liquid -25%</td>
<td>10.70 c</td>
</tr>
</tbody>
</table>

- **70%** increase in marketable yield with Perfectose™ powder (+25%)

Perfectose™ powder was applied 24 days prior to Perfectose liquid at flowering and 7 days at fruiting stage respectively.

- Amino acids provide plant cells with an immediately available source of nitrogen, which generally can be taken by the cells more rapidly than inorganic nitrogen.

- Results of significant yield increase are consistent with those of Ruiz and Romero (1999b) who reported that amino acid translocation towards the fruits produced the highest yield.
### KEY RESULTS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Varietal characteristics as per seed producer</th>
<th>Control trt</th>
<th>Perfectose P +25%</th>
<th>Perfectose P -25%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of fruit (cm)</td>
<td>11-15</td>
<td>16.2</td>
<td>18.7</td>
<td>17.8</td>
</tr>
<tr>
<td>Diameter of fruit (mm)</td>
<td>-</td>
<td>11.0</td>
<td>12.3</td>
<td>11.3</td>
</tr>
<tr>
<td>Yield (kg/m²)</td>
<td>-</td>
<td>10.1</td>
<td><strong>17.8</strong></td>
<td>12.1</td>
</tr>
</tbody>
</table>

### CONCLUSION

- This study has demonstrated that amino acid stimulants do enhance growth and development as well as the yield of chilli plants.
- Perfectose™ powder (+25%) proved to be the most effective treatment at promoting utmost increase in all the parameters studied.
RECOMMENDATIONS & FUTURE WORK

- Perfectose™ powder could be a promising avenue for farmers to maximise the yield of chilli
- To investigate the application of Perfectose™ powder on other important food crops
- To assess the effect of Perfectose on the shelf life of chilli fruits

LIST OF REFERENCES

Thank you for your kind attention

QUESTIONS??