EFFECT OF DIFFERENT CARBON AND NITROGEN SOURCES ON THE 
BIOMASS OF BEAUVIERA BASSIANA

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ABSTRACT
The selective Beauveria bassiana isolate effects on different carbon and nitrogen sources with the basic YPD medium. Study of different concentration media 250 g/ml amount of medium with sucrose and dextrose in minimum value 15 g/L, and maximum value 30 g/L percent and four nitrogen as well as carbon sources viz., KNO₃, NaNO₃, (NH₄)₂SO₄, NH₄NO₃ at 0.15 g/L, 0.20 g/L, 0.25 g/L and 3.0 g/L percent on the mycelia biomass of fungi, Beauveria bassiana, were evaluated, independently. The results revealed that starch @ 35 g/L was the best carbon source which recorded maximum dry biomass of the fungus followed by sucrose (4.44 g/250 ml) and fructose (3.16 g/250 ml). Among nitrogen sources, KNO₃ (5.00 g/250 ml) was found to be best source followed by NH₄NO₃ (4.12 g/250 ml) at 0.4 per cent for multiplication of Beauveria bassiana.

KEYWORDS - Beauveria bassiana, Biomass, Carbon sources, N-Source, YPD

INTRODUCTION
The intensive use of chemical in agriculture has yielded fruitful results in terms of improving total production but over the years it adversely affected the environment. Over use of chemical fertilizers has seriously deteriorated the “Hidden Hunger” by increasing chemical load, it is toxic rather than benign to surrounding flora and fauna on which community depends for other needs. In view of these side effects, the necessity for sustainable crop production through eco-friendly pest management technique is being largely felt in the recent times. Of the several microbial pathogens viz., bacteria, fungi, viruses, protozoans and entomopathogenic nematodes reported, only a few have been studied systematically for their usefulness. Fungal biological control agents can be ineffective if conidia are unable to germinate because water availability is suboptimal (Doberski, 1981; Gillespie & Crawford, 1986; Hsiao et al., 1992) if they have inadequate carbohydrate reserves (Lane et al., 1991a; Harman et al., 1991). One way to overcome these problems is to modify the carbohydrate content of the fungal inocula (Harman et al., 1991; Hallsworth & Magan, 1994). A careful evaluation of these beneficial pathogens can lead to gainful exploitation in microbial control programmes (Burges, 1998). Entomogenous fungi are potentially the most versatile biocontrol agents, due to their wide host range that often results in natural epizootics. An attractive feature of these fungi is that infectivity is by contact and the action is through penetration (Nadeau et al., 1996). Additionally, commercial considerations such as identification of existing or novel isolates, quality control of product and patent protection (Leathers et al., 1993) would benefit the development of efficient process for large scale multiplication.

MATERIALS & METHOD
To study the growth pattern of B. bassiana on different carbon and nitrogen source on the basis of biomass produced by the fungi were evaluated by varying different carbon sources in the basic PDA medium with lactose, starch, fructose and dextrose at 1, 2, 3 and 4 percent, respectively. Sources at recommended dose (4%) in the basal media served as the check. Similarly, different nitrogenous sources viz., KNO₃, NaNO₃, (NH₄)₂SO₄ and NH₄NO₃ were evaluated at KNO₃, NaNO₃, (NH₄)₂SO₄, NH₄NO₃ at 0.15, 0.20, 0.22 and 0.23 percent. Initially, the fungi were cultured on Sabouraud’s Maltose Yeast Extract (SMAY) Agar plates for two weeks. The conidial suspension was prepared by shaking conidia from a 5 mm diameter agar plug into a test tube containing 10 ml sterile water mixed with 0.05 per cent Tween 80. The conidial suspension was mixed thoroughly by shaking at 80 rpm for 10 min and the conidial population was determined using Haemocytometer. Two hundred microlitre (0.2 ml) aliquot of the final suspension was inoculated into 250 ml broth containing different sources and levels of carbon and nitrogen. The flasks were aerated on a shaker at 90 rpm under room temperature for 8-9 days. After complete mycelia growth, the fungal mat was taken out and filtered through Whatman No. 1 filter paper, later dried in an oven at 60°C to constant weight and dry weight was recorded.

RESULTS & DISCUSSION
The ubiquitous natural occurrence of the species B. bassiana, its long history of use in biocontrol, carbon and nitrogen are the most vital nutrients required for growth and sporulation (Campbell et al., 1983). Starch, among the carbon sources studied, supported the highest growth of B. bassaina (8.12 g/250 ml) followed by sucrose (7.0 g/250 ml) and fructose (5.73 g/250 ml). Lactose supported least growth with only 5.0 g/250 ml of dry biomass production.
Carbon and nitrogen sources on the biomass of *Beauveria bassiana*

(Table 1 and Fig 1). In earlier studies, the most effective carbon source for sporulation of *Nomuraea rileyi* was reported to be dextrose (IM *et al.*, 1988) and maltose (Balardin and Loch, 1989). Edelstein *et al.* (2004) on the other hand found that media with potato extract induced higher growth rate. The interaction effect of carbon source and levels on biomass production of *B. bassiana* was maximum with starch at 30 g/l (8.12g/250ml).

As well as increases concentration contains medium up to 15 to 30g/L, mean biomass also increased, from 4.32g at 15g/L to 8.12g/L at 30g/L. Among the different nitrogen containing medium evaluated for production of *Beauveria bassiana* KN0₃ (4.72 up to 7.13g/250ml) was found to be best source followed by NH₄NO₃ (5.56 upto 6.70 g/250ml). However, when NaNO₃ was used as a nitrogen source, there was reduction in the growth (4.48g/250 ml). The optimum concentration of nitrogen was found to be 2.5g/L (7.13g/250ml) for all nitrogen source (Table 2 and Fig 2). Li and Holdon (1994) also found KN0₃ support better growth and sporulation of *Beauveria bassiana* than (NH₄)₂SO₄. The NH₄ ions acidify the medium and the acidity up to certain level encourages the growth of fungi but beyond that limit, it is probably responsible for induction of sporulation as inferred by Rath *et al.*, (1995), while characterizing *Beauveria bassiana* strain on different source of organic acids as carbon sources.

**TABLE 1:** Total biomass production of *Beauveria bassiana* on carbon containing growth medium.

<table>
<thead>
<tr>
<th>Carbon source</th>
<th>Total dry biomass content (g/250 ml)</th>
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<tbody>
<tr>
<td></td>
<td>15 g/L</td>
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<tr>
<td>Lactose</td>
<td>5.0</td>
</tr>
<tr>
<td>Starch</td>
<td>5.42</td>
</tr>
<tr>
<td>Fructose</td>
<td>4.47</td>
</tr>
<tr>
<td>Sucrose</td>
<td>5.62</td>
</tr>
<tr>
<td>Dextrose</td>
<td>6.13</td>
</tr>
</tbody>
</table>

**FIGURE 1.** Total biomass production of *Beauveria bassiana* on carbon containing growth medium

**TABLE 2.** Total biomass production of *Beauveria bassiana* on nitrogen containing growth medium.

<table>
<thead>
<tr>
<th>Nitrogen source</th>
<th>Total dry biomass content (g/250 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.5 g/L</td>
</tr>
<tr>
<td>NaNO₃</td>
<td>4.48</td>
</tr>
<tr>
<td>KNO₃</td>
<td>4.72</td>
</tr>
<tr>
<td>(NH₄)₂SO₄</td>
<td>6.48</td>
</tr>
<tr>
<td>NH₄NO₃</td>
<td>5.00</td>
</tr>
</tbody>
</table>

**FIGURE 2.** Total biomass production of *Beauveria bassiana* on nitrogen containing growth medium.
REFERENCES


