ASSESSING THE IMPACT OF DIFFERENT CULTURE MEDIA ON FUNGAL GROWTH FOR SUSTAINABLE PEST MANAGEMENT

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Abstract

In the current agricultural context, biological control is advancing, and entomopathogenic fungi play a crucial role in integrated pest management. It is necessary to cultivate these entomopathogenic fungi on a large scale for their use in pest control. Fungi rely on essential nutrients for their growth, which can be supplemented using different culture media. These media provide the fungi with carbohydrates, minerals and moisture. Different media support the growth of fungi. In the particular study, the effects of three media (PDA, SDAY, and SMAY) were assessed on eight fungal isolates; including four of *Beauveria bassiana* and one isolate each of *Penicillium simplicissimum*, *Clonostachys rosea*, *Purpureocillium lilacinum*, and *Talaromyces pinophilus*. SDAY was found to be the most favourable medium for the growth of all fungi, except for one isolate of *Beauveria bassiana*, which exhibited the highest response in PDA.

Keywords: Entomopathogenic fungi, Media, Growth, Diameter.

INTRODUCTION

Fungi, as highly diverse microorganisms, have adapted to thrive in various environments. In order for these fungi to grow, a well-balanced mixture of different components, known as media, is necessary. Culture medium refers to a blend of various constituents in appropriate proportions, providing the essential nutrients needed for fungal growth and multiplication. A broad range of media types is utilized, and they have an impact on fungal growth, texture, pigmentation and sporulation. All these depend on composition of media, p^H, temperature and water constituents (Northolt and Bullerman, 1982; Kumara and Raval, 2010). Different culture media have varying effects on fungal growth. Two types of culture media are commonly employed for fungal growth: non-selective media, which lack antibiotics, and selective culture

media, which incorporate antibiotics to hinder the growth of gram-positive and gram-negative bacteria.

A wide range of media is available for the cultivation of fungi, and there is not a single media that is universally suitable for all types of cultures (Alexopoulos and Beneke, 1952). These media can exist in different physical states like solid, liquid, and semi-solid. PDA (Potato Dextrose Agar) is the most frequently utilized media for culturing fungi. However, there are other media options apart from PDA that can be employed for fungal cultivation. The composition of different media can modify the characteristics of fungi, including their metabolic secretion patterns. The objective of the current study was to assess the impact of three different culture media on eight fungal isolates, aiming to identify the most suitable medium for fungus isolation and growth.

MATERIALS AND METHODS

The laboratory experiments were carried out at Insectary, Tamil Nadu Agricultural University, Coimbatore. Through the soil baiting technique, a total of eight entomopathogenic fungal cultures were isolated. These cultures include four isolates of *Beauveria bassiana* (TNAU OTC 1, TNAU SGG 1, TNAU DKT 1 and TNAU IDP 1)), one isolate each of *Penicillium simplicissimum* (TNAU OTE 1), *Clonostachys rosea* (TNAU OTD 1), *Talaromyces pinophilus* (TNAU OTY 1) and *Purpureocillium lilacinum* (TNAU KDP 1).

Three different culture media, namely Potato Dextrose Agar (PDA), Sabouraud's Dextrose Agar Yeast (SDAY) and Sabouraud's Maltose Agar Yeast (SMAY), were utilized in this study (Table 1). All the media were supplemented with streptomycin sulphate at a concentration of 100mg/l, and a p^H value of 5.5 was maintained (Arti and Kalpana, 2016). A fungal disc with a diameter of 6 mm was placed at the centre of 9 cm petriplate and then incubated at a temperature of 25 ± 5°C for a period of 21 days. The experiment was conducted in triplicates to ensure reliability and accuracy of the results.

The radial growth of fungi in various media was measured and recorded in this study according to Afifah and Saputro (2020). Morphological characteristics and sporulation of fungi were observed for each type of media. Statistical analysis was performed using SPSS 29.0 software to analyze the obtained data.

RESULTS AND DISCUSSION

The growth of fungi was influenced by the culture media used, as indicated in Table 2. Among the tested media, SDAY demonstrated the best performance, followed by SMAY, while PDA resulted in comparatively less growth, with a few exceptions. Interestingly, SDAY showed poor performance in supporting the growth of isolate TNAU IDP 1 (Bb), whereas PDA showed the best results for this particular isolate. For the isolates TNAU OTC 1 (Bb) and TNAU SGG 1 (Bb), the radial growth was comparable across all three media. Morphological differences were also observed among the fungi cultivated in different media. Sporulation and metabolite secretion also varied depending on the specific medium used. The colony diameter of fungi in

different media can be found in Table 3, and the mean growth of fungi in different media is depicted in Figure 1.

The growth of fungi was relatively lower for TNAU OTE 1 (Ps), but it displayed a high level of sporulation. In the case of TNAU OTD 1 (Cr), metabolite secretion was higher in PDA compared to SDAY and SMAY. Isolates TNAU OTY 1 (Tp) and TNAU OTD 1 (Cr) were identified as the fastest growing fungi among tested isolates.

The findings of this study diverged from previous research conducted by Xu *et al.* (1984), Maheshwari *et al*. (1999), Saha *et al*. (2008), and Arti and Kalpana (2016). Those studies consistently reported that PDA yielded the best results compared to other media used. However, the findings of the current study differ, indicating that alternative media outperformed PDA.

CONCLUSION

There was a significant effect of media on the growth of fungal colonies, sporulation, and texture. *Beauveria bassiana* isolate TNAU IDP 1 grew well in PDA media, whereas the other fungi exhibited better growth in SDAY, followed by SMAY. These findings emphasize the specific medium preferences of each fungus for achieving optimal growth.

ACKNOWLEDGEMENTS

With deep sense of gratitude, the first author acknowledges Indian Council of Agricultural Research for providing with ICAR JRF/SRF Fellowship.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

References

1. Afifah L & Saputro NW, 2020. Growth and viability of entomopathogenic fungus *Beauveria bassiana* (Balsamo) Vuillemin in different alternative media. In *IOP Conference Series: Earth and Environmental Science*, *468*(1), 012037. IOP Publishing.
2. Alexopoulos CJ & Beneke ES, 1952. Laboratory manual for introductory mycology. In: Laboratory manual for introductory mycology, Minneapolis, Burgess Publishing Company.
3. Arti P & Kalpana P, 2016. Impact of different culture media on the growth rate of fungi isolated from different infected plants. *International Journal of Recent Scientific Research*, *7*(6), 12080-12083.
4. Kumara KL & Rawal RD, 2010. Influence of carbon, nitrogen, temperature and p^H on the growth and sporulation of some Indian isolates of *Colletotrichum gloeosporioides* causing anthracnose disease of papaya (*Carica papaya* L). *Tropical Agricultural Research and Extension*, *11*.

5. Maheswari SK, Singh DV & Sahu AK, 1999. Effect of several nutrient media on the growth and sporulation of *Alternaria alternate*. *Journal of Mycopathological Research*, *37*(1), 21-24.
6. Northolt MD & Bullerman LB, 1982. Prevention of mold growth and toxin production through control of environmental conditions. *Journal of Food Protection*, *45*(6), 519-526.
7. Saha A, Mandal P, Dasgupta S & Saha D, 2008. Influence of culture media and environmental factors on mycelia growth and sporulation of *Lasiodiplodia theobromae* (Pat.) Griffon and Maubl. *Journal of Evironmental Biology*, *29*(3), 407.
8. Xu SQ, Yuan SZ & Chen XC, 1984. Study on the pathogenic fungus (*Alternaria tenuis* Nees) of poplar leaf-blight. *Journal of North Eastern Forestry Institute*, *12*(1), 56-64.

Table 1: Composition of media (1 litre)

Media*	Components	Quantity (g)**
PDA	Peeled potato	200
	Dextrose	20
	Agar	15
SDAY	Dextrose	40
	Peptone	10
	Yeast extract	5
	Agar	15
SMAY	Maltose	40
	Peptone	10
	Yeast extract	5
	Agar	15

*PDA- Potato dextrose agar, SDAY- Sabouraud's dextrose yeast agar, SMAY- Sabouraud's maltose yeast agar

**g- In grams

Table 2: Pattern of fungal growth on different media

Fungi	Culture media	Radial growth (mm)* (Mean ± SE)	Texture	Sporulation
Beauveria bassiana (TNAU SGG 1)	PDA	68.58 ± 1.08	Powdery	Moderate
	SDAY	72.58 ± 1.17	Powdery	High
	SMAY	71 ± 1.32	Powdery	Moderate
Beauveria bassiana (TNAU OTC 1)	PDA	67 ± 2	Powdery	Moderate
	SDAY	73.42 ± 0.46	Powdery	High
	SMAY	71.42 ± 0.44	Powdery	Moderate
Beauveria bassiana (TNAU DKT 1)	PDA	66 ± 0.14	Cottony	Moderate
	SDAY	70.08 ± 0.08	Powdery	High
	SMAY	69.17 ± 1.88	Powdery	High
Beauveria bassiana	PDA	74.5 ± 1.51	Cottony	Moderate

(TNAU IDP 1)	SDAY	56.33 ± 0.42	Cottony	Low
	SMAY	65.25 ± 0.29	Cottony	Moderate
Penicillium simplicissimum (TNAU OTE 1)	PDA	63.33 ± 0.30	Powdery	High
	SDAY	71.25 ± 0.25	Powdery	Moderate
	SMAY	69.33 ± 0.42	Powdery	Low
Clonostachys rosea (TNAU OTD 1)	PDA	66.83 ± 0.36	Cottony	High
	SDAY	86.58 ± 0.74	Cottony	High
	SMAY	71.33 ± 0.87	Cottony	High
Purpureocillium lilacinum (TNAU KDP 1)	PDA	56.92 ± 2.35	Cottony	Moderate
	SDAY	83.25 ± 1.88	Cottony	High
	SMAY	67.17 ± 1.73	Cottony	Moderate
Talaromyces pinophilus (TNAU OTY 1)	PDA	71.17 ± 0.44	Cottony	Moderate
	SDAY	88.5 ± 0.29	Cottony	High
	SMAY	80.17 ± 1.17	Cottony	High

*Radial growth observed after 21 days

Table 3: Colony diameter (mm) of entomopathogenic fungi on different media upto 21 days

Fungi	Media	3	9	15	21
Beauveria bassiana (TNAU SGG 1)	PDA	4.92	19.67	42.08	68.58
	SDAY	15.75	41.17	59.08	72.58
	SMAY	11.17	31.25	52.58	71
Beauveria bassiana (TNAU OTC 1)	PDA	4	20.92	41.58	67
	SDAY	15.25	39.33	64.5	73.42
	SMAY	9.58	29.08	49.42	71.42
Beauveria bassiana (TNAU DKT 1)	PDA	5.83	26.92	46	66
	SDAY	14.67	38.83	52.42	70.08
	SMAY	9.75	32.5	49.33	69.17
Beauveria bassiana (TNAU IDP 1)	PDA	12	29.92	50.25	74.5
	SDAY	8.17	29.33	44.08	56.33
	SMAY	5.41	25.67	45.33	65.25
Penicillium simplicissimum (TNAU OTE 1)	PDA	4.33	21.92	40.92	63.33
	SDAY	12.25	34.42	52.08	71.25
	SMAY	9.08	27.33	50.42	69.33
Clonostachys rosea (TNAU OTD 1)	PDA	5.5	24.42	44.17	66.83
	SDAY	17.5	40.58	68	86.58
	SMAY	11.5	33.17	51.58	71.33
Purpureocillium lilacinum (TNAU KDP 1)	PDA	5.58	24.75	42.58	56.92
	SDAY	19.25	44.67	65.67	83.25
	SMAY	9.5	30	47.25	67.17
Talaromyces pinophilus (TNAU OTY 1)	PDA	6.33	26.42	49	71.17
	SDAY	15.92	39	64.17	88.5
	SMAY	11.08	31	53	80.17

Figure 1: Effect on fungal growth by different media