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Mass multiplication of biocontrol agent *Chaetomium brasiliense* using different substrates under South Gujarat condition

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Abstract
Agricultural substrates were used for mass multiplication of *Chaetomium brasiliense* (C2). Experiment carried out in laboratory condition where significantly higher spore population was found in pigeonpea stalk (55.00 c.f.u/g) followed by paddy straw, sugarcane trash, sorghum stalk, sugarcane stalk, FYM and cotton stalk. Least sporulation was observed in wheat straw (30.67 c.f.u/g). *C. brasiliense* population was gradually increased up to 30 days of inoculation and then it was decreased within 60-90 days.

Keywords: *Chaetomium brasiliense*, biocontrol, mass multiplication, *in-vitro*

Introduction
The practical implementation of integrated biological control technology to control plant diseases has been successfully introduced to growers in China, Philippines, Russia, Thailand and Vietnam by using new broad-spectrum biological fungicides from *Chaetomium* in the form of pellet and powder formulation. Biological products of *Chaetomium* are useful, not only for the protection against plant diseases, but can also be used for curative effects of plant diseases. It does not lead to development of resistance in plant pathogens it does not have phytotoxic effects, do not create any pollution problems as it is eco-friendly, promote plant growth, induces resistance in host and hence increase soil fertility. It significantly minimizes losses due to crop diseases and reduces cost of production, increases yield, quality and profit. As a good cellulose decomposer mass multiplication of *Chaetomium* sp. has been done on various substrates *i.e.* cotton stalk, pigeon pea stalk, sorghum stalk, sugarcane trash and wheat straw (Terdal, 2005) [1]. These substrates are also provide essential medium for growth *i.e.* nitrogen and carbon source. *C. globosum* grew on organic wastes *viz.*, cotton stalk, pigeonpea stalk, groundnut shells, sorghum stubbles and soybean trash (Gawade, 2001) [2].

Material and Methods
Collection of various substrates:
For the mass multiplication of *C. brasiliense* (C2) various solid medium *viz.*, cotton stalk, sorghum stalk, pigeonpea stalk, sugarcane stalk, wheat straw, paddy straw and FYM were collected from different locations of Navsari.

Mass multiplication of *C. brasiliense* (C2) on various substrates:
The substrate *viz.*, 100 gm FYM were powdered and sieved through 1 mm mesh while 50 gm each of cotton stalk, sorghum stalk, pigeonpea stalk, sugarcane stalk, wheat straw and paddy straw were presoaked in sterile water for two hours. Autoclavable high density polythene. (HOPE) bags with 0.2 mm thickness of size 20 x 25 cm were used for mass multiplication. Fifty grams of each substrates were filled in bags with moisture which was adjusted to 60 per cent then it was tightly closed and sterilized at 1.05 kg/cm^2 pressure twice for 30 minutes. Bags were inoculated with 2 agar discs (9 mm) cut from the periphery of previously grown culture of *C. brasiliense* (C2). The bags were incubated at room temperature for 30 days. Observations were recorded on various days interval. Observations were recorded by counting number of colony forming unit (c.f.u/ ml) by using serial dilution plate technique.

Results and Discussion
The comparison of different medium for multiplication of *C. brasiliense* (C2) was also tested and the results pertaining to mass multiplication studies are presented in Table 1 here as under: After 30 days significantly highest spore population was observed in case of all substrate where higher spore count was found in pigeonpea stalk (55.00 c.f.u/g) while least sporulation

was observed in wheat straw (30.67 c.f.u/g). Similarly spore population gradually decreased in next 60 days, where higher spore count was observed in pigeonpea stalk (44.00 c.f.u/g) and least sporulation was observed in wheat straw (17.00 c.f.u/g). After 90 days *C. brasiliense* (C2) population was almost declined and higher spore population was observed in pigeonpea stalk (9.77 c.f.u/g). Least sporulation were observed in FYM (1.93 c.f.u/g), cotton stalk (1.77 c.f.u/g) and wheat straw (1.50 c.f.u/g).

Overall experimental results (Table 1) indicated that the all treatments were significantly different and effective. *C. brasiliense* (C2) population was gradually increased at 30 days of inoculation and then it's decreased slowly from to 60-90 days. As a result, pigeonpea stalks found to be useful and commonly available cheaper source for mass multiplication at laboratory condition. The results are in agreement with the findings of Selvakumar *et al*. (2001) [5], Bhagat (2008) [3], Faruk *et al*. (2015), Waghunde *et al*. (2016) [6] and Mohiddin *et al*. (2017) [4]. Selvakumar *et al*. (2001) [5] and Bhagat (2008) [3] recorded that peat soil, sorghum grain and wheat grain were found best for the growth of *Chaetomium* and also showed good viability of ascospores. Faruk *et al*. (2015), Waghunde *et al*. (2016) [6] and Mohiddin *et al*. (2017) [4] reported that various substrates *viz*., rice bran, wheat straw, charcoal etc. were used for mass multiplication of *Trichoderma* sp. Results differ from present investigation due to different bio control agents.

Table 1: Evaulation of various solid substrates for mass multiplication of *Chaetomium brasiliense* at monthly interval

Treatment	Substrate	30 days (c.f.u/g)	60 days (c.f.u/g)	90 days (c.f.u/g)
T_1	Cotton stalk	32.00	21.00	1.77
T_2	Sorghum stalk	43.00	32.00	7.67
T_3	Pigeonpea stalk	55.00	44.00	9.77
T_4	Sugarcane stalk	42.67	31.67	5.93
T_5	Wheat straw	30.67	17.00	1.50
T_6	Paddy straw	52.00	41.00	9.00
T_7	FYM	34.33	23.67	1.93
T_8	Sugarcane trash	44.00	33.33	8.00
S. Em. ±		0.76	0.71	0.18
C.D. at 5%		2.29	2.12	0.55
C.V. %		3.17	4.02	5.61

Photo 1: Evaluation of various substrates for of mass multiplication of *Chaetomium brasiliense*

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