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RESEARCH ARTICLE

SOME OBSERVATIONS ON THE BEHAVIOUR OF *Geotrichum candidum* AND *Fusarium oxysporum* IN CULTURE MEDIA BASED ON DOMESTIC WASTES

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ABSTRACT

In the course of an isolation procedure some consistent gap was observed between *Geotrichum candidrum* and *Fusarium oxysporum* in overgrown dilution plates. This behaviour was investigated. *G. candidum* and *F. oxysporum* were isolated in pure culture. The organisms were plated diametrically, 4cm apart in 9cm Petri dishes, on ripe plantain peel agar, unripe plantain peel agar, cassava peel agar, sweet potato peel agar, yam peel agar, orange peel agar and cocoyam peel agar. The plates were inocubated at 25°C for 15 days. Growth towards the centre and the gap between the two fungi were measured. *Geotrichum candidum* grew better than *Fusarium oxysparum* on all the media except on cassava peel agar where *F. oxysporum* grew better. The gap between the organisms was affected by media. The gap may be due to some unascertained factor(s). No clear zone of influence was observed.

INTRODUCTION

In the course of an isolation procedure, *Geotrichum, candidum* and *Furarium oxysporum* were observed to grow together with a consistent gap between them in overgrown dilution plate. In overgrown dilution plates at 10^{-5} and food wastes particle plates. The gap seemed to be affected by the kind of base of the media. *Fasarium oxysporum* and *Geotrichum candidum* are soil fungi which grow on all purpose media and on plant materials (Domsch and Gam, 1980; Barnett *et al.,* 2000; Gente *et al.,* 2006; Godwin-Egein and Arinze, 2003). *Fasarium oxysporum* is the most economically important, labile and variable species of the genus *Fasarium* (Gorden, 1960; Kurtzman and Fell, 1998). It occurs chiefly as a soil saprophyte, but numerous strains are serious pathogens of many crops. They have the ability to live almost indefinitely in soil with the result that normal rotational cropping is not a practical control measure (Bath, 1971). *Fasarium oxysporum* colonies grow fast reaching

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4 – 6.5cm diameter in 4 days at 25°C. it parasitizes oospores of *Phytophthora cactorium* (Sneh *et al.,* 1977), antagonizes a number of fungi *in-vitro* (Jeziorska, 1974; Park, 1964; Ujevic *et al.,* 1970) and inhibits the development of the nematode *Heterodera ochachtei* in sugar beets (Kaiser, 1964). *Geotrichum candidum* also has fast growing colonies reaching 5.0 – 6.0cm diameter in 5 days at 25°C. *Geotrichum candidum* is a common fungus with worldwide distribution mainly in soil and various plant substrates (De Hoog *et al.,* 1986; Smith *et al.*, 2000). The organism has been reported to cause rot of some fruits (citrus, tomato, muskmelon, squash and cucumber) (Butler *et al.,* 1965; Smith *et al.,* 2000), but it has not been reported to have any antagonist effect on any organism. The investigation looked at the growth and behaviour of *Furerium oxysporum* and *Geotrichum candidum* when the two fungi grew together culture media based on some food wastes.

MATERIALS AND METHODS

Geotridum candidum Link ex Leu and *Fusarium oxysporum* Schlecht emend Sny and Hans were isolated from food wastes buried in dark brown loamy soil of the botanical garden of the University of Port Harcourt, Nigeria. *Geotrichum candidum* was identified following Gente *et al.* (2006) and *Fasarium oxysporum*, following Booth (1971).

10cm depth. At 4 days after display, samples of the wastes were dug up and about 3mm x 3mm pieces were plated on PDA. Pure cultures of *F. oxysporum* and *G. candidum* were raised from the above plates and maintained on PDA. Chips of the various peels were sun dried for 7 days and and oven dried at 110°C for 24 hours, ground to powder and included in agar media. Inclusion rate of each powder in the media was 20%.

The following media were prepared using the various powders individually; ripe plantain peel agar (RPPA), unripe plantain peel agar (UPPA), cassava peel agar (CPA), sweet potato peel agar (SPPA), yam peel agar (YPA), orange peel agar (OPA), and cocoyam peel agar (CoPA). Three millimeter diameter cores of the pure cultures of *F. oxysporum* and *G. candidum* were plated diametrically 4cm apart on the media in 9cm diameter Petri dishes. Control plates had each of the two fungi alone, placed to one side of the dish. Petri dishes were incubated for 15days at 25°C. Radial growth of the fungi towards the centre was measured daily. The gap between the two fungi was measured during and after advancement of growth towards the centre. There were four replicates and 3 trials. Results were statistically analyzed using ANOVA (Gomez and Gomez, 1984).

Table 1. Growth of Fo and GC on Culture media based on domestic wastes for 15 days

Media / Organism	RPPA	UPPA	CPA	SPPA	YPA	OPA	CoPA	Mean
Fusarium oxysporum	1.4122	1.4875	1.7607	1.4155	1.4297	1.4700	0.6133	1.3578
Geotrichum candidum	1.8633	1.9100	1.6800	1.7763	1.7903	1.5375	1.6700	1.7467
Mean	1.6378	1.6988	1.6933	1.5944	1.6100	1.4888	1.1417	1.5520

Values were means of 12 replicates. Means followed by the same letter are not significantly different at p=0.05 by Ducan's New Multiple Tut (DMT). "RPPA = Ripe Plantain Peel Agar; UPPA = Unripe Plantain Peel Agar; CPA – Cassava Peel Agar; SPPA = Sweet Potato Peel Agar; YPA = Yam Peel Agar; OPA = Orange Peel Agar; and CoPA = Cocoyam Peel Agar"

Table 2. Gap between Fo and GC on the 15th day of growth

Media	RPPA	UPPA	CPA	SPPA	YPA	OPA	CoPA	Mean
GAP	1.6298	1.8825	1.4018	1.8113	1.8597	1.4940	2.8485	1.8465

"RPPA = Ripe Plantain Peel Agar; UPPA = Unripe Plantain Peel Agar; CPA – Cassava Peel Agar; SPPA = Sweet Potato Peel Agar; YPA = Yam Peel Agar; OPA = Orange Peel Agar; and CoPA = Cocoyam Peel Agar"

Peels of ripe and unripe plantain (*Musa paradisiocal*), cassava (*Manilhot esculantus*), yam (*Dioscora rotundata*), sweet potato (*Ipomea batatas*), orange (*Citrus sinensis*) and cocoyam (*Colocasia esculanta*) were displayed under soil at

RESULTS AND DISCUSSION

Table 1 shows the growth of *Fusarium oxysporum* and *Geotrichum candidium* on the seven media, namely, ripe plantain peel agar (RPPA), unripe

plantain peel agar (UPPA), cassava peel agar (CPA), sweet potato peel agar (SPPA), yam peel agar (UPA), orange peel agar (OPA) and cocoyam peel agar (CoPA). Radial growth at the initial stage and growth towards the centre was progressive until the 6th day when in most of the media it apparently stopped on the 10th day. Growth on CoPA was very slow. *Geotrichum candidium* grew better on all the media except on CPA, where, *F. oxysporum* (1.76) outgrew *G. candidum* (1.68), but there was no significant difference (p = 0.05) observed between the growth of the two organisms. The difference in growth of the two fungi on the same medium may be as a result of utilizable nutrients available to each of them (Weinhold and Bowmann, 1968). Since *G. candidum* grew better, it may have metabolized the available nutrients more efficiently. The growth of *F. oxysporum* on CoPA was the poorest. It was significantly different (P = 0.05) from the growth *of F. oxysporum* on all other media and that of *G. candidum* on all media. The growth of *G. candidum* on CoPA was not significantly different (P = 0.05) from that on all other media. Best growth of *G. candidum* was observed in UPPA, which was significantly different (P = 0.05) from only that on OPA, but not the other media. This observation corroborates the observation by De Hogg *et al.,* (1986), that *G. candidum* utilizes diverse plant substrates. *Fusarium oxysporum* was observed to grow best on CPA which was not significantly different (p = 0.05) from the other media except CoPA. There was a similar observation by Godwin-Egein and Arinze (1999). The growth of *G. candidum* ranked almost the same on all the media. A consistent gap was observed between the two organisms. The distance of the gap is shown on Table 1. The least gap (1.04) was observed on CPA which was significantly different (P = 0.05) from all other media except on OPA. The widest gap was observed on CoPA (2.8485). This was significantly different (P = 0.05) from the other media. No significant difference (P = 0.05) was observed amongst the gaps on RPPA, UPPA, SPPA and YPA. The narrow gap between the two organisms on CPA may have because both organism had enhanced vigour by utilizing available nutrients well in the substrate. Both organisms grew well (Table 1). This was not so in all the other media, as the disparity between the two organisms was large, which was 1.06 on CoPA. The better growth of *G. candidum* than that of *F. oxysporum* suggested that the former had a stronger saprophytic ability and competitiveness than the latter. But the reverse was the case on cassava peel. This speculation was because no antibiotic was detected and there was no clear zone of influence. The non-detection of antibiotics did not rule out the fact that there may be some other factor(s) that may be responsible for the gap, which was not ascertain. There was no parasitic activity. Weinhold and Bownman (1968) had speculated that antagonistic ability or potential resides in every organism, but the kind and modus operandi of the factor(s) responsible for the gap and the behaviour of the organism was difficult to elucidate.

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