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Favorable cultural conditions for mycelial growth of *Alternaria brassicace*, causing leaf blight of cabbage under *In-vitro* conditions

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Abstract
Cabbage is one of the most important cole crops. Now it is grown almost throughout the year for economic and nutritional value. India occupies 2nd position in cabbage production worldwide .As it suffers from a wide array of fungal, bacterial and viral disease which is causing severe loss in the yield . *Alternaria brassicace*, the causal agent of leaf blight of cabbage is a fungal pathogen has been reported from all the continents of the world as well as in the state of Uttarakhand, Himachal Pradesh and Telaganna. The study on the growth of the fungus in different media revealed that Potato Dextrose Agar Medium supported significantly the maximum radial growth (68.4mm) of the test fungus followed by Oat Meal Agar Medium and the less growth was observed in the Czpez Dox Agar and Corn Meal Agar Medium. The Potato Dextrose Agar Medium was found to be a best medium for the growth of *Alternaria brassicace*.

Keywords: Nutrient agar media, Czepek Dox agar, potato dextrose agar, glucose Asparagne agar, Sabourad`s agar medium, oat meal agar medium

Introduction
Cabbage (*Brassica oleraceaevar*. cabitata L), it is consider as a main vegetable member of the family brassicaceae cultivated in the world. It is known as leafy green or purple biennial plant .it is grown in all the seasons (summer and winter). It has different shapes from flat to long oval outline (Nieuwhof, 1969). It is annual vegetable crop and Cole crop which is related to Cauliflower, Broccoli etc .It is popularly grown vegetable crop through-out the world. It occupies the pride place among all the Cole crops. The term cabbage arises from French Cobbache that means head. The family Brassicaceae has 3700 spices. Cabbage is the most important crop in family Cruciferous and is grown for thickened main bud called head. China stands number one in the production of cabbage in the world followed by the India (no 2). The China is the largest producer of all the brassicaceae crops in the world around 47%. According to the food and agriculture organization (FAO) of United nation.

It is also used in salads and boiled vegetables and also dehydrated vegetables, for cooking purposes. It is cultivated at 0.310 M ha with a total production of 6.870 M Mt and average yield of 22.1 Mt/ha. The main producing states for cabbage are Uttar Pradesh, Orissa, Bihar, Assam, Maharashtra, Karnataka and West Bengal. Generally the cabbages are of two types these are green and red. These contain different types of glucosinolates specially singrin, which is especially useful for the prevention of cancer. The red cabbage has strong antioxidant having a therapeutic role in a number of diseases. The cabbage contain different vitamins like vitamin A and C, minerals, sugars, 25cals in form of carbohydrates 5.8g,dietary fiber 2.5g,fat 0.1 g, protein 1.28g. (Rop *et al*., 2009) [10].

The disease Alternaria leaf spot of cabbage is prevalent in all the cabbage growing states and is one of the major biotic problems which limits its production and also quality of produce there are two species of Alternaria which cause serious damage in cabbage i.e. *Alternaria brassicae* and *Alternira brassicicola*, they can survive saprophytic ally outside of the host and diseased crop debris. The primary sites of survival from year to year are the resting spores. The genus Alternaria first recognized by Nees in 1817. In 1836, Berkele described macro sporium brassicae, which was later renamed Alternaria brassicae by Saccardo in 1886, as causal fungus on plants belonging to the Brassicaceae family. *A. brassicae's* most prominent signs are yellow dark brown to black circular spots with goals like concentric circles. *A. brassicae* and *A. brassicicola* may affect host species at all stages of growth inculcating seeds.

The symptoms of the seedlings cause dark stem lesions immediately after germination, which may result in damping off or stunted seedlings. The pathogens may kill the pod stalks in the pods before seed formation. They can also be a way by which bacterial soft rot reaches the stem, contributing to plant death (Chupp and Sherf, 1960) [4]. In addition to the degradation of the seed crop, pathogens can stay with the seed transmitting the disease to other fields and causing seedlings to fail (Rangel, 1945) [9]. It is recorded that the disease occurred in the first fourth night of July and the highest disease incidence was observed when the temperature range between 25 to 28ºC and the average relative humidity was higher than 80%. Rainfall was highly responsible for the extent of infection and the growth of disease (Ahamad and Narain 2000) [1]. The disease incidence could cause yield reduction up to 35 -60% (Kolte et al,1987) [6].

Materials and Methods

Study on different solid media for viability and maintenance of *Alternaria brassicacae*

We used seven different solid medium for the testing of growth of fungus viz., Nutrient Agar Media, Czepek Dox Agar, Potato Dextrose Agar, Glucose Asparagne Agar, Sabourad`S Agar Medium, Oat Meal Agar Medium, Corn Meal Agar Medium. The medium with highest growth was suitable for the growth of *Alternaria brassicae*.

Different Solid Media

Different solid media and their composition used during the course of present investigation are given below.

Potato Dextrose Agar(PDA)	**Medium**
Potato slices	200 gm
Dextrose	20 gm
Agar – agar	20 gm
Distilled water	1000 ml
Ph	(6.0)
Czpek Dox Agar	**Medium**
Potassium phosphate	1 g
Sodium nitrate	3 g
Potassium chloride	0.5 g
Ferrous chloride	0.01 g
Agar	20 g
Sucrose	30g
Mgso4	0.5g
Distilled agar	1000 ml
pH	7.2±0.2
Temperature	25 °C

Sabourauds`s Agar	**Medium**
Mixture of digest of animal tissues & pancreatic digest of casein (1:1)	10gm
Dextrose	40 g
Agar – agar	15 g
Distilled water	1000 ml
pH	5.6±0.2

Corn Meal Agar	**Medium**
Corns	50g
Agar	15g
Distilled water	1000 ml
pH	(6.0)

Nutrient Agar	**Medium**
Beef extract	1.5 gm
Yeast extract	1.5 gm
Peptic digest Animal tissue	5 gm
Sodium chloride	5 gm
Agar	15 gm
Distilled water	1000 ml
Temperature	25 C
pH	7.4±
Oat Meal Agar	**Medium**
Oats	30g
Agar	15g
Distilled water	1000ml
Glucose asparagine Agar	**Medium**
Glucose	10g
Asparagine	0.5g
Agar	15g
P^H	7.0

Measure of growth

For determining the variation in the colony growth of *Alternaria brassicae*, the colony growth of fungus in each petri plate was measured when entire control petri plate was covered by fungus. The colony growth was measured along two diameters at right angles and averaged.

Results and Discussion

The pathogen was grown on seven different media which were selected for analysis. Observations on the radial growth rate of Alternaria brassicae were reported that at the end of 7th day of inoculation .Irrespective of media used Potato dextrose agar media (PDA) was found to be most suitable culture media for the growth of *Alternaria brassicae* .Statistical analysis of the data showed that the radial growth Of Potato Dextrose Agar was found to be statistically higher than that of other cultural media and followed by Oat Meal Agar Media (63.0 mm), Glucose Asperagine Agar media (55.8) and, Sabourauds Agar Media (53.0mm) and minimum growth was observed on Czpex Dox Agar and Corn Meal Agar.

Table 1: Radial growth (mm) of *Alternaria brassicae* on different nutrient medium

S. No	Solid Medium	Radial growth of *Alternaria brassicae*
1	Oat Meal Agar	63.0
2	Czpexdox Agar	25.6
3	Potato Dextrose Agar	68.4
4	Sabourauds Media	53.0
5	Nutrient Agar Medium	45.0
6	Corn Meal Agar	20.08
7	Glucose Asparagine Agar	55.8
SE m±		1.47
CD		1.6

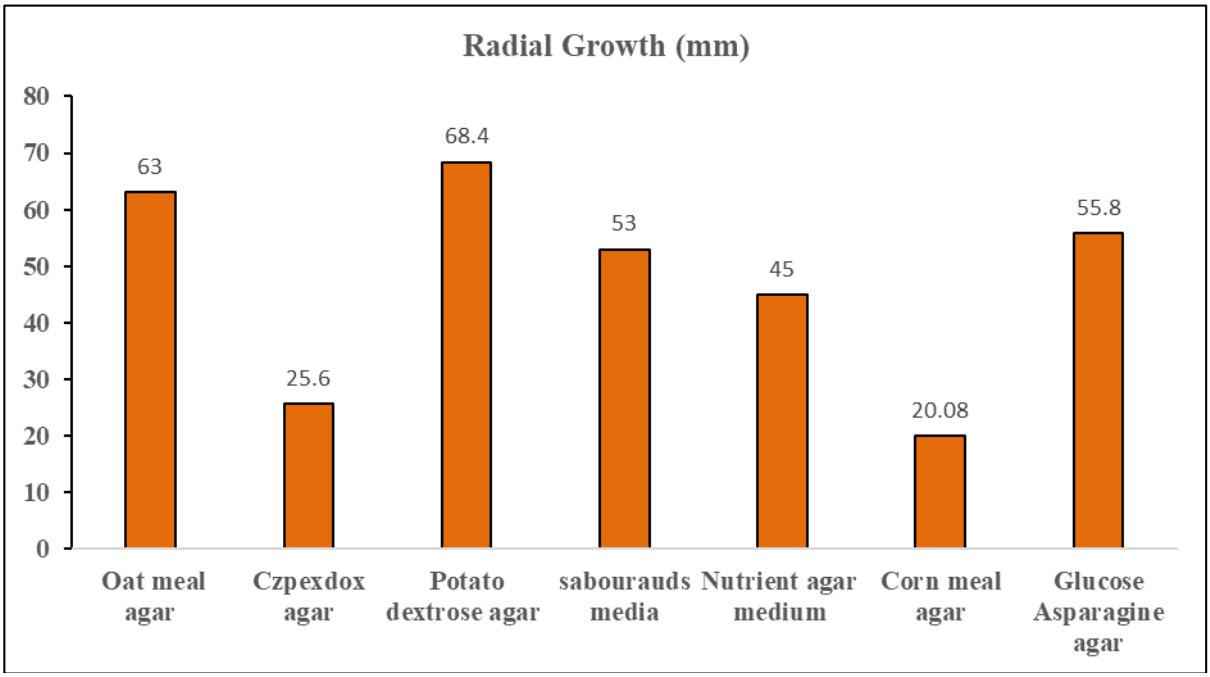

Fig 1: Graph Shows That Radial Growth (mm) of *Alternaria brassicae* on Different Solid Medium

The study on the growth of the fungus in different media revealed that Potato Dextrose Agar Medium supported significantly the maximum radial growth (68.4) of the test fungus followed by oat meal agar medium and the less growth was observed in the Czpez Dox Agar and Corn Meal Agar Medium .The Potato Dextrose Agar Medium was found to be a best medium for the growth of *Alternaria brassicace*. The present investigation is supported by Ansari *et al.* (1989) [2] and Kumar *et al*. (2003) [7] also reported that growth of *Alternaria brassicacae* was well grown On Potato Dextrose Agar Medium and less growth was recorded on the Czpex Dox Agar and Corn Meal Agar Medium. Chandra Sekhar J, *et al*, (2020) [5] who also used same solid media against the pathogen and similar results were observed.

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