Research Journal of Recent Sciences _____ ISSN 2277-2502
Vol. **6(9),** 1-7, September **(2017)** *Res. J. Recent Sci.*

The effect colors of light and aeration on growth and sclerotia formation of *Sclerotium rolfsii* on chili rot

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Available online at: www.isca.in, www.isca.me
Received 30th November 2016, revised 25th July 2017, accepted 10th August 2017

Abstract

The pathogenic fungi Sclerotium rolfsii is damaging in numbers of vegetables, which causes several losses. This pathogenic fungi has shown to cause collar rot and root rot in many vegetable crops and has need suggested way to control the pathogen as well as vegetable diseases. Since effective control of plant diseases depends on the throughout knowledge of the causal organisms. In various factors which directly and indirectly the development of growth and sclerotia of Sclerotium rolfsii. In the present experiment effect of continuous exposure different color of light black, blue, green, red, yellow, sealed and control (as without control served as control) on S.rolfsii radial growth, number and weight of sclerotia was assess by poisoning technique. In the investigation it was observed that growth of Sclerotium rolfsii on potato dextrose agar medium were not affected by blue, green ,yellow and sealed, but it affect by red and black 2.34mm to 2.67mm respectively. But in this investigation total number and weight of sclerotia found affected by sealed and black light after fifteen days of incubation periods. From result of experiment, we conclude that proper aeration is essential for the development of sclerotia.

Keywords: Aeration, Incubation periods, Light, Sclerotia, *Sclerotium rolfsii*.

Introduction

The devastating soil borne phyto-pathogen which causes severe loss at the time the time of seedling development included *Sclerotium rolfsii*. The fungi *Sclerotium rolfsii* also caused leaf spots in several crops and wild plants. The pathogen *Sclerotium rolfsii* also caused saccardo is soil borne facultative parasite which attacks hundred of cultivated and wild plants in the fields, causing heavy losses. The *Sclerotiumn rolfsii* is a soil borne phytopathogenic fungus founds in tropical's and sub-tropical's regions of the word and causing serious yield losses in crops of high economic importance. The pathogenic parasite on a number of cultivated and non-cultivated plants but rarely on cereals[1,2].

Various biotic and a biotic factors, which directly or indirectly influence the development of sclerotia were discussed in literature[1,3-5]. Since effective control of plant diseases depends on the throughout knowledge of the causal organisms. The *Sclerotium rolfsii* should be studied extensively, especially in India, so as to reduce the tremendous loss of the vegetables and other crops brought about by this pathogen. In the present experiments reported in this paper, studies have been initiated which could be extended to finds outs where light effect on the sclerotial production of *S.rolfsii*.

Light stimulation also occurs in *Fusarium oxysporium, Sclerotium delphinii* and *Sclerotium rolfsii*[6-8]. In addition, some isolate of *Aspergillus* and *Verticillum dahlia* may be indifferent to light[9,10].

In *Botrytis cinerea* and *Botrytis squamosa*, sclerotium production is promoted by yellow, red and infrared light[11,12]. Despite the responsible far-reaching effects of light conditions, many resent investigation on the possible for reaching effects of light conditions, many resent investigation on the physiology of Sclerotium formation have been made with little regards to the control of light regime[13].

The work of air and light was also done by Humipherson-Jones, F.M. and Cooke R.C.[14], Maramba P., Ekuful S.K.[15] and Sudarshan Maurya et al.[16] on same *Sclerotium rolfsii*. In the view of this, some of the effects of light on Sclerotia formation in *Sclerotium rolfsii* were investigated. So as to reduce the tremendous loss of the crops brought about by this pathogen.

Materials and methods

Isolation and purification of Sclerotium rolfsii: The pathogenic fungi *Sclerotium rolfsii* was isolated by picking individual sclerotia from the infected plant collected. The infected portion / sclerotia were surface sterilized with 0.1% mercuric chloride for a few seconds followed by three washing in sterilized distilled water.

They were sclerotia were then placed on potato dextrose agar medium in petridishes and incubated at 27+/- $\pm^0$C. The effect of different color of light and aeration on inhibition of the *Sclerotium rolfsii* was studied using poisoning food technique[17]. The potato dextrose agar medium was prepared and after

solidification in poured petriplates of the medium, mycelial dick 4mm diameter were cut from 4-5 day-old actively growing culture of *Slcerotium rolfsii* and each was placed in the center of pertiplates containing PDA.

These petriplates were wrapped in black (in order to create dark condition), blue, green, red, yellow and sealed (that sealed with lab tape to check the aeration) and other three left unwrapped, one without any color or control. The growths of *Sclerotium rolfsii* were observed after every 24 hours till 72 hours, with fungal colony, size, and color of sclerotia. After fifteen days, sclerotia were counted and harvested and they recorded. Their dry weight yield determined.

The role of air for the growth and development of (basidiospores) sclerotia, the experiment was concurrently conducted to assess it. For this PDA was poured in thrice. Each plate was inoculated with a mycelial disk and sealed with the help of lab tape. In the complete sealing, each contain thrice. After inoculation and sealing petriplates were inoculated at 27 +/- ^{0}C room temperature. Visuals observations were periodically recorded after every 24 hours till 72 hours.

Results and discussion

The effect of *Sclerotium rolfsii* growth, number and weight of sclerotia revealed from Table-1, 2, Figure-1 and 2, and Graph-1, 2, 3, 4 and 5.

The effect of continuous exposure to black, blue, green, red, yellow, sealed and control (as without any color serve as control) light on fungal radial growth, number and weight of sclerotia after 72 hours of incubation period for growth and fifteen days of incubation for number and weight of sclerotia observed in Table-1, 2 and Figure-1, 2, 3, 4, 5, 6, 7.

The red light affect fungal growth maximum with 87.33 mm followed by black and control that affect 0.33 mm more than red light i.e. 87.66 mm after 72 hours of incubation. But remaining blue, green, yellow and sealed gave same radial growth that is 90 mm or fully cover petriplates of *Sclerotium rolfsii*. These effects of light results can divided in two, in which second categories of maximum growth that is 90.00 mm given by blue, green, yellow and sealed although it shows 2.67 and 2.34 mm maximum growth compared to red, black and control.

In the investigation, it was observed that growth of *Sclerotium rolfsii* on potato dextrose agar medium were not affected by blue, green, yellow and sealed, but it affect by 2.34 mm to 2.67 mm red to black and control respectively.

These null / no effect of the fungal growth proves *Sclerotium rolfsii* growth are not affected by light and dark condition was also observed by Sudarshan Mayura et al.[16], but in this investigation total number of sclerotia, total weight of sclerotia found affected by sealed and black light after incubation of fifteen days. From Table-2 the formation of sclerotia affect by due to continuous exposure to black, blue, green, yellow, sealed and control light on potato dextrose agar medium. The strong major, affect found by sealed or unaeration condition. In the present experiments, we found that proper aerations are essential for the development of sclerotia. From it the conclusion come or it is already known that sclerotia development and severity of pathogenesis is maximum in sandy soil which provides more aerations as compared to heavy soil because it has less porosity more compactness, less aerations which hinder the formation of abundant sclerotia.

In this experiment sealed (petriplates) result found to be most strong effect against the black and others. Complete or hundred percent sealed gives least number of sclerotia i.e. 39, it is 13.00 average of total number of sclerotia. After sealed (close aerations), black and dark light found next after sealed with 122 numbers of sclerotia with 40.66 averages. After these above two yellow, control red green color recorded number of slclerotia in increasing order (i.e.157,159,167,168) finally blue color of light gave maximum number of sclerotia (i.e. 187) with 62.33 average. Other averages of other colors of light sowed in tables. In sealed plate and darks affected mycelia growth and number of sclerotia significantly as compared to the control, and other plates. Among all completely sealed plates, lest number of sclerotia form (39) with 13.00 average after fifteen days of incubation period.

The effect of aerations on basidiospore induction and sclerotia formation was also reported by Sudarshan Mayura et al[18].

These were no significant difference in mycelial growth among them, but significant difference was observed in sealed and controlled. The detail of color number, average, distribution and other characteristics also elaborate in Table-1.

The effect of different color of light on the total weight of the sclerotia found after fifteen days of incubation can screened in Figure-1, 2, 3, 4, 5, 6, 7 and Table-1, 2 incubation resulted that in a significant reduced in number and weight with their average of sclerotia producer was sealed plates 0.18 total and with the average 0.06.

The sclerotia are the asexual structures formed due to the aggregation of fungal mycelium. After sealed plate, the increasing total weight of sclerotia goes like follow.

Sealed < Control < Black < Blue < Red < Yellow < Green (total weight of sclerotia).

The green color of light recorded 0.06 mg of total weight of sclerotia, with highest maximum average of total weight 0.2. The average total weight of sclerotia increases as follow.

Sealed<Blue<Black<Control<Red<Yellow<Green

Table-1: The effect of continuous exposure of different color of light on total weight, number and average of total weight, number of sclerotia of *Sclerotium rolfsii*. (After fifteen days of incubation periods).

Different color of light, sealed and control	Radial mm after of	Growth of 24-hours Incubation	In *S.rolfsii* interval period	After 15-days of incubation			
	24 h	48 h	72 h	Total weight of sclerotia	Average of total weight of sclerotia	Total number of sclerotia	Average of total number of sclerotia
Black	32.33	67.66	87.66	0.45	0.15	122	40.66
Blue	29.00	67.33	90.00	0.38	0.12	187	62.33
Green	31.33	68.33	90.00	0.60	0.2	168	56.00
Red	31.00	66	87.33	0.52	0.17	167	55.66
Yellow	29.33	66.33	90.00	0.54	0.18	157	50.66
Sealed	31.66	66.33	90.00	0.18	0.06	39	13.00
Control	29.33	65.33	87.66	0.51	0.17	159	53.00

*Total weight or total number means sum of triplicate.

Table-2: The distribution of sclerotia on pertiplate observed.

Different color of Light	Distribution of Sclerotia						Color of sclerotia		
	One Side	All over plate	At center	Margins	In groups/ cluster	Away from one other	White color basidi-spores	Tan/ brown color Sclerotia	Black color sclerotia
Black	-	-	+	+	+		-	+	+
Blue	-	-	+	+	+	+	-	+	+
Green	-	-	+	+	-	+	+	+	+
Red	-	-	-	+	+	+	-	+	+
Yellow	-	-	-	+	+	+	+	+	+
Sealed	-	-	+	+	+	+	+	+	+
Control	+	-	+	+	+	+	+	+	-

*+ = Presence, - = Absence,*White basidiospore found at margins of active mycelium.

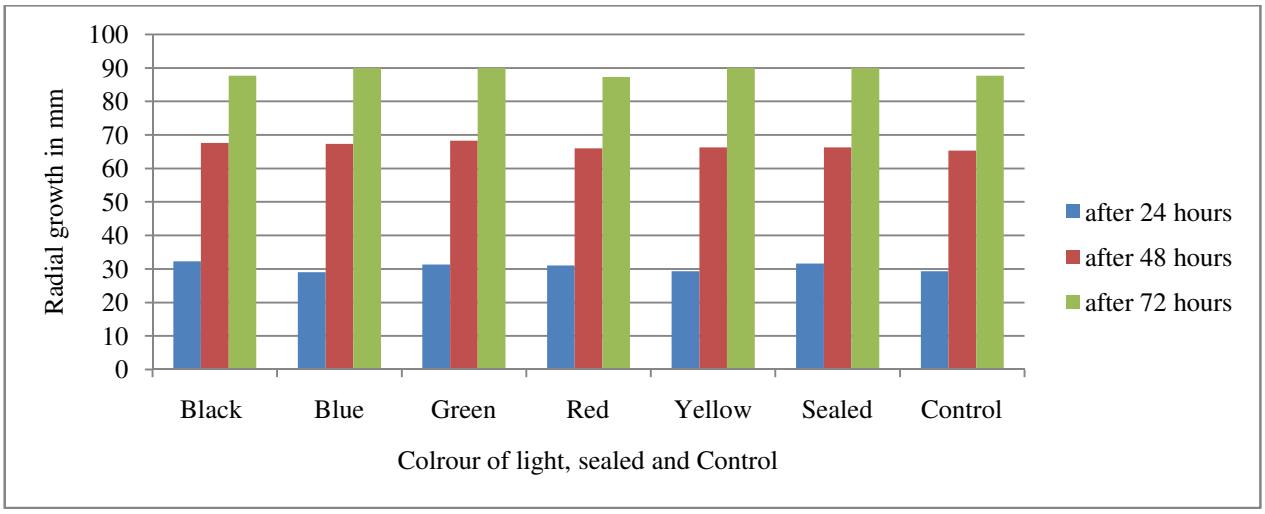

Figure-1: The effects of colors of light and sealed condition on radial growth of *Sclerotium rolfsii*.

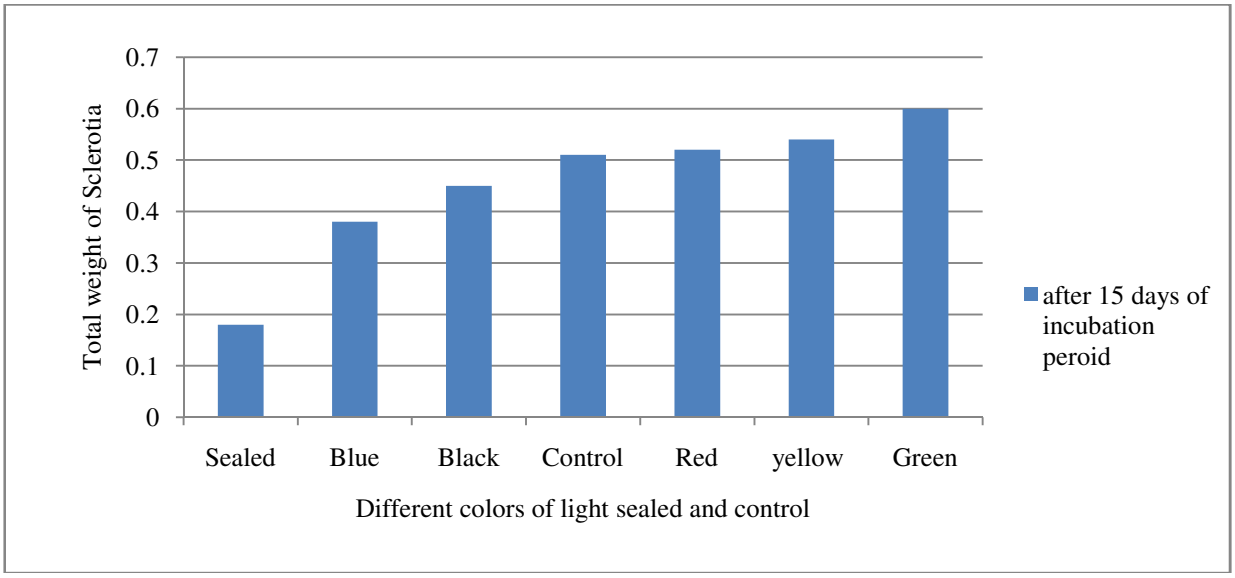

Figure-2: The effect of different light and aeration on total weight of sclerotia of *Sclerotium rolfsii*.

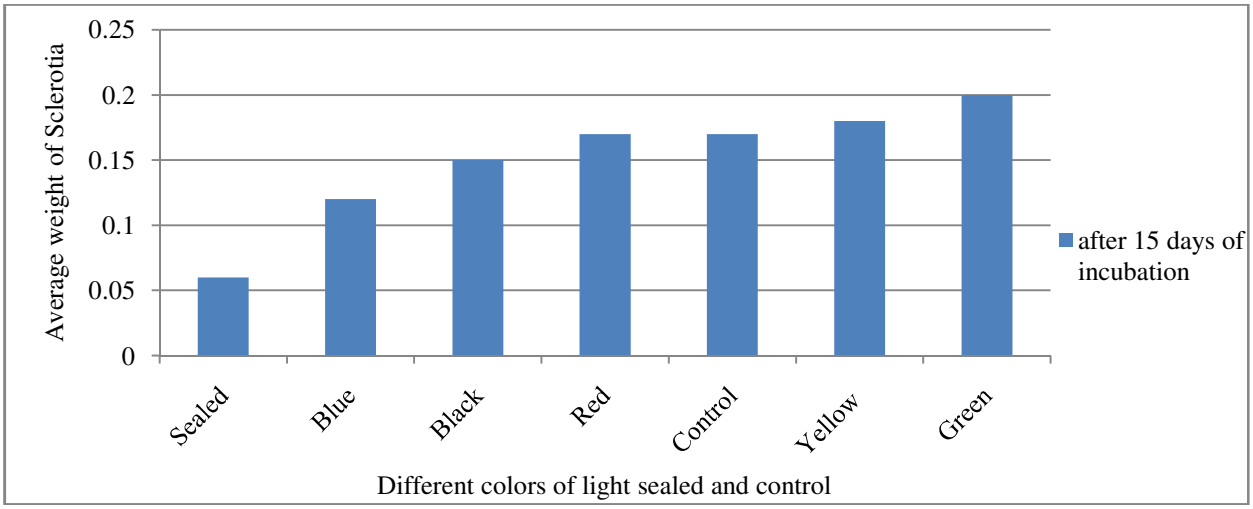

Figure-3: The average total weight of sclerotia of *Sclerotium rolfsii* affected by different colors of light and sealed condition.

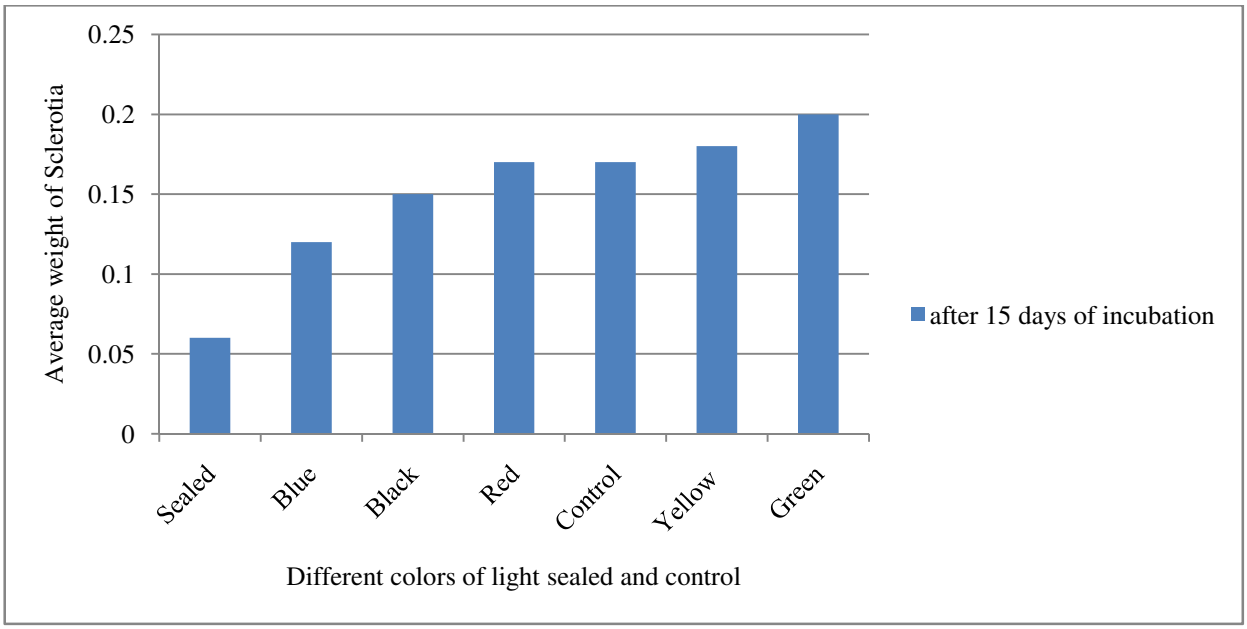

Figure-4: The effect of light and sealed condition on the total number of sclerotia of *Sclerotium rolfsii*.

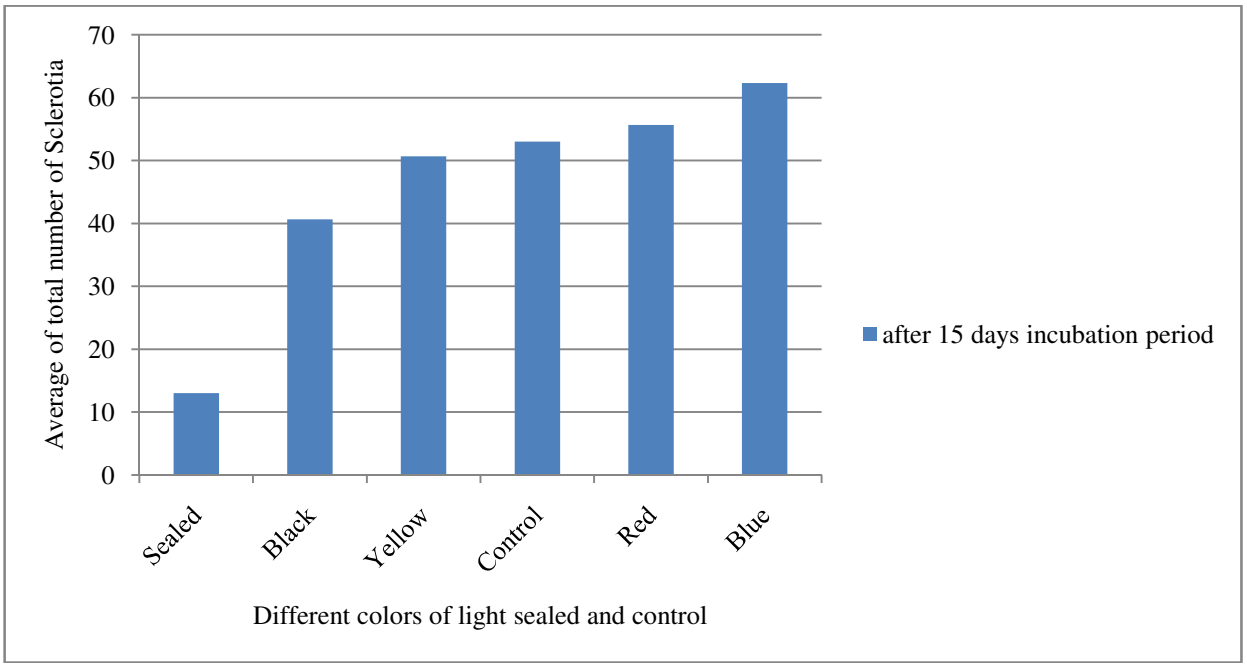

Figure-5: The effect of light and sealed condition on the average total number of sclerotia of *Sclerotium rolfsii*.

Discussion: In some fungi sporulation are not affected by light conditions. The light affect in those fungi which respond to light condition to sporulation may either be positive, inducing sporulation or negative suppressing sporulation. Requirement of light for sporulation varies from an absolute requirement for initiations of reproductive bodies to a qualitative response such as in increase the number of reproductive apparatus. In the *Fusarium*, light bring about macrospore production[6,18,19]. The present work indicate that the different light, with black and no aerations effects in sealed, affect the production of sclerotia of *Sclerotium rolfsii* especially when this is the assessed by the dry weights. In present research conclusively demonstrated that in sclerotial production under the various light conditions. Future programs extending this work should examine whether this difference is reflected in other physiological activities of the isolates such as oospores to fungicides and pathogenesis. It would be valuable also to repeat the present test using many isolates as possible to determine whether light response could be acceptable basis for identifying physiological races of *Sclerotium rolfsii*.

Figure-6: The view of different colors of light and sealed condition on radial growth of *Sclerotium rolfsii*.

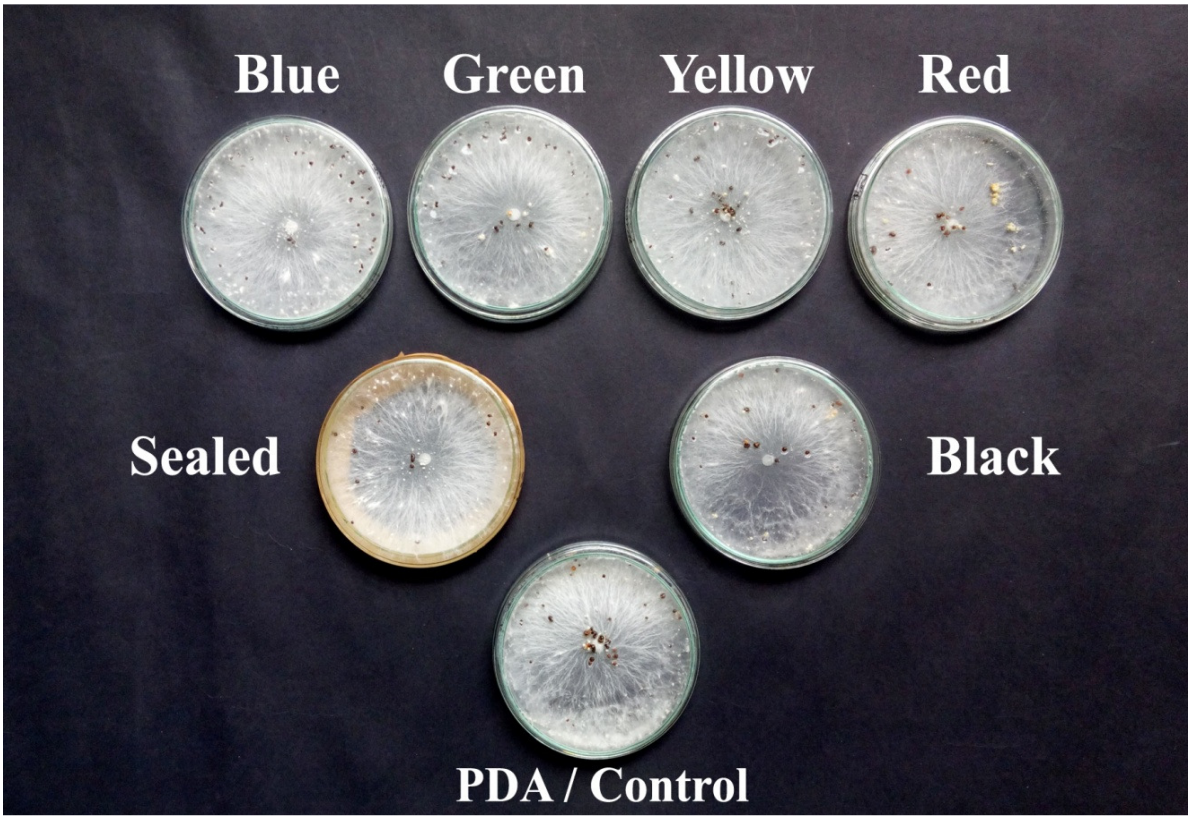

Figure-7: The picture of different colors of light and sealed condition on sclerotia formation of *Sclerotium rolfsii*.

Conclusion

The *Sclerotium rolfsii* causing disease to many food crops and require and require need to control pathogen and protection disease caused by it. Since the effective control of vegetables disease and other plant crops diseases depends on throughout knowledge of pathogen. That is why *Sclerotium rolfsii* studied in this paper under the physical factor effect of light, and aerations condition on growth and basidiospore formation. The effect of different color on light incubation result concluded that in a significant reduced in number and weight with their average of sclerotia producer was in the sealed plates total and with the average. The sclerotia are of sealed plate they are at top total weight of sclerotia. The green color of light recorded of total weight of sclerotia, with highest maximum average of total weight. The average total weight of sclerotia increases as sealed followed by blue followed by black followed by control followed by red followed by yellow and green. The strong major, affect found by sealed or unaeration condition. In the present experiments, we found that proper aerations are essential for the development of sclerotia.

Acknowledgement

The author's are express gratitude to Department of Botany, of Dr. Rafiq Zakaria College and Dr. Babasaheb Ambedkar Marathada University, Aurangabad (M.S.) comfort and provided that necessary amenities for this research work.

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