Isolation of endophytic fungi was performed by taking imprint of surface sterilized explants on the malt extract agar plates and then chopping, and transferring it to fresh plates of malt extract agar. Isolated endophytic fungi were further purified by repeated sub-culturing. Purified endophytic fungi were identified by looking at their morphological characteristics under microscope and rDNA sequencing. In the present study 20 endophytic fungi were isolated, of these 4 were from W. somnifera, 9 from J. curcas and 7 from T. indica. Isolates Dothideomycetes sp. EF1 and Alternaria tenuissima EF2 were isolated from leaf and Thielavia subthermophila EF3, Alternaria sp., EF4, Nigrospora oryzae EF5, Colletotrichum truncatum EF6 and Chaetomium sp. EF7 were isolated from stem of T. indica whereas Dothideomycete sp. EF19, Alternaria tenuissima EF20, and one isolate of C. globosum EF18 were isolated from leaf and other isolate of C. globosum EF17 was isolated from stem of W. somnifera. From J. curcas isolates Nigrospora oryzae EF8, Colletotrichum truncatum EF9 and EF 10, Fusarium proliferatum EF11, Chaetomium sp. EF12, Colletotrichum truncatum isolate EF13 and EF 14, Guignardia camelliae EF15 and Alternaria destruens EF16 were obtained. Dothidiomycete sp. EF1 and EF19 and Alternaria tenuissima EF2 and EF20 were isolated from T. indica as well as from W. somnifera, whereas C. truncatum EF9, EF10, EF13 and EF14 and N. oryzae EF5 and EF8 were isolated from T. indica as well as J. curcas.

All the endophytic fungi isolated were subjected to dual culture bioassay to test their antifungal activity against plant pathogenic fungi Fusarium oxysporum, Sclerotinia sclerotiorum and Rhizoctonia solani. Among fungal endophytes isolated from W. somnifera, T. indica and J. curcas isolates EF1, EF2, EF3, EF4, EF6, EF7, EF9, EF10, EF12, EF13, EF14, EF17, EF18 and EF20 showed good activity against S. sclerotiorum and F. oxysporum, and EF15 and EF29 were active against S. sclerotiorum only however none exhibited activity against R. solani. Dothidiomycete sp. isolated from T. indica was active against S. sclerotiorum and F. oxysporum while Dothidiomycete sp. isolated from W. somnifera was active against S. sclerotiorum only. All three plants harbor endophytic fungi of beneficial activity.
Results indicate that these fungi may be helping the plants in protecting from pathogenic fungi. *C. globosum* isolate EF17, EF18, *C. truncatum* isolate EF13, *Dothideomycete* sp. isolate EF1, EF19 and *Thielavia subthermophila* EF3 have been found to be potential biocontrol agent for the management of *S. sclerotiorum*. Further work on these fungi with regards to its pathogenicity on crop plants and other non-target effects will be useful in developing new biocontrol agent against crop pests.

Endophytic fungi having strong antifungal activity in dual culture test were taken up for further multiplication, metabolite extraction and their bioactivity. Based on dual culture assay results of objective 2 endophytic fungi, EF18 isolated from *W. somnifera*, EF9, EF10, EF12, EF13, EF15 isolated from *J. curcas* and EF1 and EF3 isolated from *T. indica* were multiplied on liquid medium and extracted with ethyl acetate by grinding and partitioning followed by extraction of ethyl acetate residue with butanol. Isolated ethyl acetate extract was dried and partitioned between 90 per cent methanol and hexane. Methanol extract of *C. globosum* isolate EF18 showed 76.58% mycelial growth inhibition (GI) at 500 µg/ml and it was at par with effect of ethyl acetate extract, which had 75.68% growth inhibition at 500 µg/ml. Methanol extract of *C. truncatum* isolate EF13 exhibited highest activity with 83.33% and 66.67% fungal growth inhibition at 500 µg/ml and 250 µg/ml respectively while ethyl acetate and methanol extract of *C. truncatum* EF10 showed 71.76% and 70% growth inhibition respectively at 500 µg/ml. Hexane extracts of *C. truncatum* isolates EF9, EF10 and EF13 yielded oil similar to oil produced by host plant i.e. *J. curcas*. These species of endophytic fungi have not been reported to produce oil so far. Since this was observed in the process of identifying antifungal agent/metabolite, oil production might not up to its potential. Further optimization is needed to find out suitable substrate for high oil production and also the genetic basis of oil production has to be understood to have long term sustenance production of oil from the target endophyte. Methanol extract of *Dothediomycetes* sp. isolate EF1 showed 66.5% growth inhibition (GI) at 500 µg/ml.

Metabolites of these endophytic fungi can also be explored for their potential as biofungicide after study of non-target effects. Growth inhibition activity of the extracts of endophytic fungi is quite crucial because the technological barrier in production, maintenance, and storage of living organism can be minimized by developing extract based biopesticide. Also, the use of living microbe for pest management could cause loss of crops, if these living microbes turn pathogenic in due course of acclimatization to the introduced condition. From quality and appearance point of view, adherence to biocontrol agent on the edible portion is of concern. However, extract based
Biopesticide will not be having such limitations. *C. truncatum* isolate can be translated into myco-herbicide and more specifically if the metabolite responsible for herbicidal activity can be recovered from the fungi, which will avoid the non-target effect due to spore dispersal on economically important crop plants.

Extract(s)/fractions of *C. globosum* EF 18, isolated as endophyte from *Withania somnifera*, were found effective against *Sclerotinia sclerotiorum* showing >80% growth inhibition. Ethyl acetate and methanol extracts were more effective than hexane extract. Since ethyl acetate extract of *C. globosum* EF18 was showing highest growth inhibition than ethyl acetate extract of other endophytic fungi isolated in the study, it was followed for bioassay guided isolation of active compound. Compound similar to antibiotic Sch 210971 (m/z 445 and $\lambda_{\text{max}}$ 290) has been isolated in pure form from the extract having antifungal activity against *S. sclerotiorum*. Isolation and characterization of the active metabolite/principle was done by various chromatographic (column chromatography, GC, HPLC, Prep HPLC, VLC, TLC) and spectroscopic (Mass and NMR) techniques. This is the first report of antifungal activity of this compound isolated from endophytic fungus *C. globosum*. Present work provides evidence that endophytic fungus *C. globosum* isolate EF18 per se and its culture filtrate has potential to be used for management of Sclerotinia-stem and root rot of chickpea. Apart from this compound other fractions of polar to medium polarity were also found effective. Fraction no. VIII from VLC column of ethyl acetate extract was having high activity with IC$_{50}$ value of 35.4 µg/ml. Further work on characterization of active metabolite as well as suitable substrate for large-scale multiplication of active endophyte and isolation of metabolites from it will lead to commercially viable extract based bio-fungicide. Study on genetic and biochemical regulation of the metabolites production can lead to identification of gene(s) responsible for up or down regulation of production of active metabolite. This study will in turn lead to increased production of metabolite in unit time and space by running the fast cycling fermenter on suitable substrate.