Analysis of AR buscular mycorrhizal fungi associated with some medicinal plants

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Abstract
Aarbuncular Miccorrhizal Fungi (AMF) which constitute a major group soil microbial community. The present study is aimed to determine natural AMF spore population dynamics in rhizosphere soil and its colonization in some medical plants under the influence of different season. The pre-dominate genera of AM fungi were also identified.

Keywords: Aarbuncular Miccorrhizal Fungi (AMF) and Medicinal Plants

Introduction
The associations of fungi with medicinal plants growing in different habitats have been studied by several earlier workers (Govind Rao et al., 1989, Selvaraj and Subramanian 1990, Aggarwal et al., 2005, Sharma et al., 2007a.) but information regarding the role of these microbes for the conservation of medicinal plants and their efficiency to promote growth yield are very few (Nelson et al., 2000, Sharma et al., 2007b.) AMF colonization varies with season and its effect also influence the establishment of plants under field condition (Giovannetti and Nicolson 1983). The present study, all these plants were found to have AMF association, Percentage of AMF colonization was noticed less in winter, remained moderate in summer and highest in rainy season. Similarly the highest number of AMF spores was found in rainy season while moderate numbers in winter and the least in summer. Glomus sp. was recorded as dominant root symbiont.

Materials and Method
The root and rhizosphere soil samples of three medicinal plants Viz., Andrographis Paniculata, Rauwolfia serpentine and Withania somnifera were screened for association of AM fungi. Three replicates of each plants were randomly sampled.

AMF fungi spore population: AM fungi spores were isolated from soil samples using wet sieving and decanting method (Gerdemann and Nicolson 1963) and were quantified using the ‘gridline intersect method’ (Adholeya and Gaur 1994).

AMF root colonization: Root colonization was observed by rapid clearing and staining technique. Percent root colonization was determined as mentioned under.

\[
\% \text{ Root colonization} = \frac{\text{Number of positive segments}}{\text{Number of segments observed}} \times 100
\]

Spores were examined and identified using manuals.

Results and Discussion
AMF colonization in roots and spore population in the rhizosphere soil samples of R. serpentine, A. paniculata and W. somnifera showed wide range of variation under different season as shown in (Table 1).

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Table 1: Seasonal variation of mycorrhizal association in R. serpentine, A. paniculata and W. somnifera during the year 2015

<table>
<thead>
<tr>
<th>Months</th>
<th>Number of spores/10g soil</th>
<th>Name of the plants</th>
<th>% root colonization</th>
<th>Name of the plants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R. serpentine</td>
<td>A. paniculata</td>
<td>W. somnifera</td>
<td>R. serpentine</td>
</tr>
<tr>
<td>January 15</td>
<td>20</td>
<td>18</td>
<td>21</td>
<td>55%</td>
</tr>
<tr>
<td>February</td>
<td>19</td>
<td>15</td>
<td>22</td>
<td>58%</td>
</tr>
<tr>
<td>March</td>
<td>18</td>
<td>16</td>
<td>22</td>
<td>61%</td>
</tr>
<tr>
<td>April</td>
<td>16</td>
<td>26</td>
<td>23</td>
<td>70%</td>
</tr>
<tr>
<td>May</td>
<td>15</td>
<td>22</td>
<td>24</td>
<td>58%</td>
</tr>
<tr>
<td>June</td>
<td>20</td>
<td>30</td>
<td>28</td>
<td>70%</td>
</tr>
<tr>
<td>July</td>
<td>25</td>
<td>34</td>
<td>27</td>
<td>74%</td>
</tr>
<tr>
<td>August</td>
<td>31</td>
<td>36</td>
<td>33</td>
<td>80%</td>
</tr>
<tr>
<td>September</td>
<td>20</td>
<td>14</td>
<td>26</td>
<td>62%</td>
</tr>
<tr>
<td>October</td>
<td>22</td>
<td>21</td>
<td>23</td>
<td>62%</td>
</tr>
<tr>
<td>November</td>
<td>16</td>
<td>22</td>
<td>18</td>
<td>60%</td>
</tr>
<tr>
<td>December</td>
<td>21</td>
<td>14</td>
<td>20</td>
<td>61%</td>
</tr>
</tbody>
</table>

Mean of three replicates ± 4.303 X Standard error, Standard deviation - ± 2.48, CD - 3.52 in all the cases.

In *R. serpentine*, percent root colonization and mycorrhizal spore counts steadily increased from June and reached to a maximum value i.e., 80% and 31 spores/10g dry soil respectively in August month of rainy season. However, both the spore population and root colonization were recorded higher in winter than in summer season. In *A. paniculata*, percentage root colonization and spore population was observed to vary from 40-84% and 14-36 spores respectively and their maximum level was recorded during July to August (rainy season). In *W. somnifera*, maximum percentage root colonization i.e. 85% and spore population i.e. 33 spores were observed during rainy season thereafter declined during winter season.

AMF spores isolated from the rhizosphere soil samples of plants understudy were identified as *G. macrocarpum, G. microcarpum, G. reticulatum* in case of *R. serpentine, G. mosseae*, *G. deserticola*, *Sclerocystis pakistanica* from *A. paniculata* and *G. mosseae, G. macrocarpum, G. reticulatum* from *W. somnifera* whereas *Glomus fasciculatum* and *Gigaspora margarita* were found commonly associated with all the plants.

In all the cases soil was more or less alkaline, reported that Glomus is frequently observed in alkaline soil. The influence of different seasons on root colonization in case of *A. paniculata* and *W. somnifera* and *R. serpentine* were recorded almost same and it was observed maximum in rainy season followed by winter and summer.

The level of AM fungal association depends on root morphology, metabolism and rate of plant growth as well as on specific soil plants system in terms of chemical nature of root exudates. In addition to these factors, pH of the soil may also play very decisive role in controlling AMF root colonization and spore population but it was found to be ineffective in the present investigation as the pH remained within narrow range of 5.0-8.5. In natural system, that seasonal fluctuations of mycorrhizal associations were closely related to plant phenology. Maximum spore population in the present investigation was observed during rainy seasons which coincides with flowering time of all three plants.

**Conclusion**

It might be correlated with the fact that during this period most photosynthate is allocated to roots and rhizomes, which helps fungal symbiont to produce more spore (Gemma and Koske 1988, Wallen 1980) [10].

Percent root colonization in all plants understudy was recorded highest during rainy season may be correlated with the work of Mason *et al.*, (1992) [11].

**References**