



E-ISSN: 2278-4136  
P-ISSN: 2349-8234  
JPP 2018; 7(4): 2309-2311  
Received: 01-05-2018  
Accepted: 05-06-2018

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## Management of stem rot of groundnut (*Sclerotium rolfsii* Sacc.) by plant oils

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**Abstract**

Four types of plant oil viz., Palmarosa (*Cymbopogon martinii*), Karanja (*Pongamia pinnata*), Citronella (*Citronella* spp.) and Neem (*Azadirachta indica*) were tested against groundnut stem rot (*Sclerotium rolfsii* Sacc) at 0.1 and 0.5 per cent concentration with twenty five different treatments (T) such as seed, soil and seed followed by soil treatment under *in situ* conditions excluding control, at BCKV, Nadia, West Bengal during two consecutive years i.e., 2003-04 and 2004-05. The observation was recorded for three parameters disease incidence, severity and yield. Among the treatments (T<sub>21</sub>) and (T<sub>22</sub>) (Seed + soil treatment with Citronella oil and Palma rosa oil @ 0.5%) showed economically significant positive response in all respective parameters compare to other however, the lowest variation was recorded in T<sub>25</sub> (control).

**Keywords:** groundnut, stem rot, management, plant oil

**Introduction**

Groundnut (*Arachis hypogaea* L.) is one of the important economic oilseed crops of the world. It belongs to the family *leguminosae*. Due to year round cultivation, groundnut crop is subjected to various diseases caused by fungi, bacteria, virus, phytoplasma, phytonematodes etc. Out of various diseases of groundnut, stem rot caused by *Sclerotium rolfsii* Sacc is a very important disease causing losses in different parts of India and throughout the world. In the first half of 20<sup>th</sup> Century, peanut production sustained losses of 10 to 20 million dollars annually due to this disease. Losses of 25 to 50% were recorded in 1938-1947. In India, this pathogen causes appreciable losses in chilli, bean, beet, carrot, cucurbit, potato, spinach betel-vine, peanut etc. (Aycock, 1966)<sup>[1]</sup>

*Sclerotium rolfsii* Sacc. Teleomorph: *Athelia rolfsii* (Curzi) Tu and Kimbrough is a destructive fungal plant pathogen causing diseases in many monocotyledon and dicotyledon plants encompassing more than 500 host species (Punja, 1984)<sup>[8]</sup>. Despite continuous research over the past century since its first report on management of the pathogen has remained a challenge. Control efforts have often met with limited success, partially due to the extensive host range, prolific growth rate and ability of the pathogen to produce large numbers of sclerotia that may remain viable in soil for several years. Furthermore, control measures effective for a particular crop in an area may not be adaptable elsewhere due to regulatory or economic constraints. Spray of chemical fungicides possesses serious threat to beneficial organisms of eco-system. Since long, researchers are using extracts of botanicals to control plant disease. Plant oils are eco-friendly and less toxic to environment, thus use of plant oils for management of fungal and viral disease is becoming more and more popular and has become a very interesting area of research. In view of this, the present study was undertaken with the objective to manage collar rot of groundnut by use of different plant oils or botanicals.

**Materials and Methods**

The experimental was carried out in two consecutive years i.e. 2003-04 and 2004-05 in Randomized Block Design having 25 treatments including a control and 3 replications at Jaguli Instructional Farm of BCKV, Nadia, West Bengal, India (Table 1). Four types of plant oils viz., Karanja (*Pongamia pinnata*), Citronella (*Citronella* spp.), Neem (*Azadirachta indica*) and Palmarosa (*Cymbopogon martinii*) were tested in two different concentrations of 0.1% and 0.5%. Three different types of method of application namely seed treatment, soil treatment and combination of seed treatment followed by soil treatment were used in the study. Before sowing, the seeds were soaked in respective oils in two different desired concentrations of 0.1% and 0.5% respectively. Control was maintained by soaking the seeds in sterile water. Percent disease incidence and percent disease index (PDI) was recorded at 90 DAS, respectively. Assessment of disease severity was done on 0-4 scale as given below:

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**Table 1:** Efficacy of Plant oil used as seed and soil treatment against stem rot of groundnut during 2003-2005 (Pooled data of two years)

Treatment	Disease Incidence (%)	% Disease Incidence over control	Disease Index (%)	% Disease Index over control	Yield (Kg/ha)
T <sub>1</sub> -Seed treatment with citronella oil @ 0.1%	39.0 (38.6)	16.4	24.5 (29.6)	47.1	383.2 (958)
T <sub>2</sub> -Seed treatment with palma rosa oil @ 0.1%	40.7 (39.6)	12.8	22.2 (28.1)	52.1	377.9 (944)
T <sub>3</sub> -Seed treatment with karanja oil @ 0.1%	42.8 (40.8)	8.3	35.0 (36.2)	24.5	333.0 (832)
T <sub>4</sub> -Seed treatment with neem oil @ 0.1%	37.9 (37.9)	18.8	43.3 (41.1)	6.6	402.1 (1005)
T <sub>5</sub> -Seed treatment with citronella oil @ 0.5%	32.6 (34.8)	30.1	32.6 (34.8)	29.7	419.6 (1049)
T <sub>6</sub> -Seed treatment with palma rosa oil @ 0.5%	26.7 (31.1)	42.8	41.0 (39.8)	11.6	441.2 (1103)
T <sub>7</sub> -Seed treatment with karanja oil @ 0.5%	38.7 (38.4)	17.1	23.0 (28.6)	50.43	390.6 (976)
T <sub>8</sub> -Seed treatment with neem oil @ 0.5%	35.7 (36.6)	23.5	26.2 (30.7)	43.5	410.8 (1027)
T <sub>9</sub> -Soil treatment with citronella oil @ 0.1%	28.3 (32.1)	39.4	34.4 (35.9)	25.8	429.5 (1073)
T <sub>10</sub> -Soil treatment with palma rosa oil @ 0.1%	27.2 (31.4)	41.7	33.4 (35.3)	28	438.1 (1095)
T <sub>11</sub> -Soil treatment with karanja oil @ 0.1%	29.9 (33.1)	26.3	22.9 (28.5)	50.6	412.4 (1031)
T <sub>12</sub> -Soil treatment with neem oil @ 0.1%	40.8 (39.6)	11.9	22.8 (28.5)	50.8	339.5 (848)
T <sub>13</sub> -Soil treatment with citronella oil @ 0.5%	26.1 (30.7)	44.1	20.2 (26.7)	56.4	443.3 (1108)
T <sub>14</sub> -Soil treatment with palma rosa oil @ 0.5%	25.7 (30.4)	44.9	17.7 (24.8)	61.8	449.2 (1123)
T <sub>15</sub> -Soil treatment with karanja oil @ 0.5%	27.8 (31.8)	39.1	23.6 (29.0)	49.1	428.2 (1070)
T <sub>16</sub> -Soil treatment with neem oil @ 0.5%	32.7 (34.8)	27.7	21.5 (27.6)	53.6	418.3 (1045)
T <sub>17</sub> -Seed + soil treatment with citronella oil @ 0.1%	29.9 (33.1)	35.8	31.5 (34.1)	32.1	420.6 (1051)
T <sub>18</sub> -Seed + soil treatment with palmarosa oil @ 0.1%	28.9 (32.5)	37.2	36.4 (37.1)	21.55	427.5 (1068)
T <sub>19</sub> -Seed + soil treatment with karanja oil @ 0.1%	25.0 (30.0)	44.7	26.0 (30.6)	43.9	444.5 (1111)
T <sub>20</sub> -Seed + soil treatment with neem oil @ 0.1%	30.5 (33.5)	34.6	16.9 (24.2)	63.5	420.2 (1050)
T <sub>21</sub> -Seed + soil treatment with citronella oil @ 0.5%	19.6 (26.2)	59.5	18.9 (25.7)	59.2	469.9 (1174)
T <sub>22</sub> -Seed + soil treatment with palmarosa oil @ 0.5%	19.4 (26.2)	58.8	23.0 (28.6)	50.4	464.6 (1161)
T <sub>23</sub> -Seed + soil treatment with karanja oil @ 0.5%	29.1 (32.6)	46.3	19.7 (26.3)	57.5	453.6 (1134)
T <sub>24</sub> -Seed + soil treatment with neem oil @ 0.5%	25.9 (30.5)	44.5	30.6 (33.5)	34	443.4 (1108)
T <sub>25</sub> - Control	46.7 (43.1)	0	46.4 (42.9)	0	235.9 (589)
CD at 0.05%	3.26		1.82		40.59

\*Figures in the parenthesis are angular transformed.

Scale	Disease severity
0	Healthy plants
1	Yellowing
2	Browning and white mycelial growth near the basal part of stem
3	Wilting
4	Complete collapse of the plant

Percent Disease Index (PDI) was calculated using the following formulae:

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{Number of plants observed} \times \text{maximum rating used}} \times 100$$

## Results and Discussion

Results of the experiment revealed that 90 days after sowing among the treatments T<sub>21</sub> and T<sub>22</sub> (Seed + soil treatment with Citronella oil and Palma rosa oil @ 0.5%) showed economically significant positive response with lowest variation in disease incidence (19.6 & 19.4%), severity (18.9 & 23%) and highest yield (469.9 & 464.6 kg/ha) respectively in all parameters. An another treatment T<sub>20</sub> (Seed + soil treatment with neem oil @ 0.1%) is found to be one of the best treatment compare to other and lowest variation recorded in T<sub>25</sub> (control). Similar results were also finding out by Singh *et al.* (1989) <sup>[10]</sup>, Banerjee *et al.* (1989) <sup>[2]</sup>, Madhavi *et al.* (2011) <sup>[7]</sup> and Guerra *et al.* (2015) <sup>[3]</sup> against *S. rolfisii* by same plant oil in both *in vitro* and *in vivo* conditions. Although many findings of such type of research work references are available in respect to control of *S. rolfisii* or other plant pathogens by use of essential oils and plant extract Thakur *et al.* (1989) <sup>[12]</sup>, Handique and Singh (1990) <sup>[4]</sup>, Khanna and Johari (1991) <sup>[5]</sup>, Kole *et al.* (1993) <sup>[6]</sup> but not much work is known in regards of their effect as seed soaking prior to sowing. Thus it can be concluded that plant oils derived from *Cymbopogon martinii*, *Citronella* spp., *Pongamia pinnata* and

*Azadirachta indica* as seed and soil treatment can prevent stem rot of groundnut caused by *S. rolfisii*.

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