CHAPTER 4

STUDIES ON MORPHO-ANATOMICAL RESPONSE OF WHEAT PLANTS TO *Spirodella polyrhiza* EXTRACTS AND ITS SIGNIFICANCE.
STUDIES ON MORPHO-ANATOMICAL
RESPONSE OF WHEAT PLANTS TO
_Spirodella polyrhiza_
EXTRACTS AND ITS SIGNIFICANCE

INFLUENCE OF 6 HRS PRE-SOAKING SEED
TREATMENT ON ROOT:

_EFFECT ON DIAMETER OF ROOT:_

Results given in Table-16 and Photo-9 show that treatments with 1 percent ether and 2 percent water extracts exercise increase in diameter of root over control. However, 1 percent ether extracts is comparatively more beneficial than water extract.

Results were statistically analysed following analysis of variance method and observed increase with 1 percent ether extract is significant at 5 percent error probability.
EFFECT OF 6 HOURS TREATMENT WITH EXTRACTS OF Spirodella polyrhiza ON WHEAT ROOT
EFFECT ON DIAMETER OF STELE:

Observations entered in Table-16 and Photo-9 show that treatments with 1 percent ether and 2 percent water extracts mark increase in diameter of stele over control. However, 1 percent ether extract is comparatively more stimulatory than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

EFFECT ON DIAMETER OF VASCULAR BUNDLES:

A perusal of Table-16 and Photo-9 shows that treatments with 1 percent ether and 2 percent water extracts exercise increase in diameter of vascular bundles over control. However, 1 percent ether extract exercises increase in diameter on vascular bundles to larger extent.

Results were statistically analysed following analysis of variance method and observed increases with both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

EFFECT ON DIAMETER OF METAXYLEM:

An examination of Table-16 and Photo-9 shows that
treatments with 1 percent ether and 2 percent water extracts mark increase in diameter of metaxylem over control. However, 1 percent ether extract is comparatively more beneficial than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

**EFFECT ON NUMBER OF PROTOXYLEM PER MICROSCOPIC FIELD**:

Results given in Table-16 and Photo-9 show that treatments with 1 percent ether and 2 percent water extracts exercise increase in number of protoxylem per microscopic field over control. However, 1 percent ether extract is comparatively more stimulatory than water extract.

Results were statistically analysed following analysis of variance method and observed increase with 1 percent ether extract is significant at 5 percent error probability.

**EFFECT ON NUMBER OF ROOT HAIR PER MICROSCOPIC FIELD**:

Observations entered in Table-16 and Photo-9 show that treatments with 1 percent ether and 2 percent water extracts mark increase in number of root hair per microscopic field
over control. However, 1 percent ether extract more effectively increases number of root hair than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and 2 percent water extracts are insignificant at 5 percent error probability.

**INFLUENCE OF 12 HRS PRE-SOAKING SEED TREATMENT ON ROOT:**

**EFFECT ON DIAMETER OF ROOT:**

Observation given in Table-16 and Photo-10 exhibit that treatments with both 1 percent ether and water extracts exercise increase in diameter of root over control. However, 1 percent ether extract is comparatively more beneficial than water extract.

Results were statistically analysed following analysis of variance method and observed increases with both 1 percent ether and water extracts are significant at 5 percent error probability.

**EFFECT ON DIAMETER OF STELE:**

Results given in Table-16 and Photo-10 show that treatments with both 1 percent ether and water extracts exercise increase in diameter of stele over control. However,
PHOTO - 10: EFFECT OF 12 HOURS TREATMENT WITH EXTRACTS OF *Spirodella polyrhiza* ON WHEAT ROOT

CONTROL

1 PERCENT ETHER WATER - EXTRACT
1 percent ether extract is comparatively more effective than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and water extracts are significant at 5 percent error probability.

**EFFECT ON DIAMETER OF VASCULAR BUNDLES:**

A perusal of Table-16 and Photo-10 exhibits that treatments with both 1 percent ether and water extracts mark increase in diameter of vascular bundles over control. However, 1 percent ether extract is more stimulatory than water extract.

Results were statistically analysed following analysis of variance method and observed increases with both 1 percent ether and water extracts are significant at 5 percent error probability.

**EFFECT ON DIAMETER OF METAXYLEM:**

An examination of Table-16 and Photo-10 shows that treatments with both 1 percent ether and water extracts mark increase in diameter of metaxylem over control. However, 1 percent ether extract is more effective than water extract.

Statistical analysis of data shows that observed effect with 1 percent ether extract is significant at 5 percent error
probability.

**EFFECT ON NUMBER OF PROTOXYLEM PER MICROSCOPIC FIELD:**

Observations entered in Table-16 and Photo-10 exhibit that treatments with both 1 percent ether and water extracts exercise increase in number of protoxylem per microscopic field over control. However, 1 percent ether extract is more stimulatory than water extract.

Results were statistically analysed following analysis of variance method and observed increase with 1 percent ether extract is significant at 5 percent error probability.

**EFFECT ON NUMBER OF ROOT HAIR PER MICROSCOPIC FIELD:**

A perusal of Table-16 and Photo-10 shows that treatments with both 1 percent ether and water extracts exercise increase in number of root hair per microscopic field over control. However, 1 percent ether extract is comparatively more beneficial than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and water extracts are significant at 5 percent error probability.
PHOTO - 11: EFFECT OF 24 HOURS TREATMENT WITH EXTRACTS OF *Spirodella polyrhiza* ON WHEAT ROOT

CONTROL

1 PERCENT ETHER WATER - EXTRACT
**EFFECT ON DIAMETER OF VASCULAR BUNDLES:**

A perusal of Table-16 and Photo-11 shows that treatments with 1 percent ether and water extracts mark increase in diameter of vascular bundles over control. However, 1 percent ether extract is comparatively more effective than water extract.

Results were statistically analysed following analysis of variance method and observed increases with both 1 percent ether and water extracts are significant at 5 percent error probability.

**EFFECT ON DIAMETER OF METAXYLEM:**

An examination of Table-16 and Photo-11 shows that treatments with 1 percent ether and water extracts exercise increase in diameter of metaxylem over control. However, 1 percent ether extract is comparatively more beneficial than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and water extracts are significant at 5 percent error probability.
### TABLE 16: RESPONSE OF WHEAT ROOT TO PRE-SOAKING SEED TREATMENT WITH Spirodella polyrhiza EXTRACTS

<table>
<thead>
<tr>
<th>SOAKING PERIOD</th>
<th>DIAMETER OF ROOT IN ( \mu )</th>
<th>DIAMETER OF STELE IN ( \mu )</th>
<th>DIAMETER OF V.B. IN ( \mu )</th>
<th>DIAMETER OF METAXYLEM IN ( \mu )</th>
<th>NO. OF PROTOXYLEM PER MICROSCOPIC FIELD</th>
<th>NO. OF ROOT HAIR PER MICROSCOPIC FIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 HRS</td>
<td>C 1%EW 2%W</td>
<td>C 1%EW 2%W</td>
<td>C 1%EW 2%W</td>
<td>C 1%EW 2%W</td>
<td>C 1%EW 2%W</td>
<td>C 1%EW 2%W</td>
</tr>
<tr>
<td></td>
<td>698.45 760.01 718.94</td>
<td>242.66 285.49 254.12</td>
<td>203.13 225.86 219.51</td>
<td>65.28 72.56 68.91</td>
<td>14.91 17.63 15.45</td>
<td>31.81 33.61 33.0</td>
</tr>
<tr>
<td>12 HRS</td>
<td>C 1%EW 1%W</td>
<td>C 1%EW 1%W</td>
<td>C 1%EW 1%W</td>
<td>C 1%EW 1%W</td>
<td>C 1%EW 1%W</td>
<td>C 1%EW 1%W</td>
</tr>
<tr>
<td></td>
<td>703.32 498.79 752.85</td>
<td>262.57 302.81 286.53</td>
<td>211.61 233.71 226.67</td>
<td>69.63 78.95 71.35</td>
<td>15.82 17.95 16.37</td>
<td>36.71 41.50 38.8</td>
</tr>
<tr>
<td>24 HRS</td>
<td>C 1%EW 1%W</td>
<td>C 1%EW 1%W</td>
<td>C 1%EW 1%W</td>
<td>C 1%EW 1%W</td>
<td>C 1%EW 1%W</td>
<td>C 1%EW 1%W</td>
</tr>
<tr>
<td></td>
<td>643.98 715.28 691.39</td>
<td>226.34 258.82 238.12</td>
<td>198.11 218.68 211.31</td>
<td>56.03 65.26 60.73</td>
<td>14.02 16.81 15.31</td>
<td>30.39 32.51 31.1</td>
</tr>
</tbody>
</table>

- C.D. = 24.50 DIFFERENCE 6 HRS 1% EW-C = 61.56 2% W-C = 20.49
- C.D. = 11.01 DIFFERENCE 6 HRS 1% EW-C = 42.83 2% W-C = 11.46

- C.D. = 2.60 DIFFERENCE 6 HRS 1% EW-C = 22.73 2% W-C = 3.63
- C.D. = 0.62 DIFFERENCE 6 HRS 1% EW-C = 2.72 2% W-C = 0.54

- C.D. = 1.91 DIFFERENCE 6 HRS 1% EW-C = 1.80 2% W-C = 1.19

- C.D. = 1.91 DIFFERENCE 12 HRS 1% EW-C = 4.79 1% W-C = 2.22

- C.D. = 1.91 DIFFERENCE 24 HRS 1% EW-C = 2.12 1% W-C = 0.72

**ABBREVIATIONS USED:** C - Control, EW - Ether-Water extract, W - Water extract, and C.D. - Critical Difference.
EFFECT ON NUMBER OF PROTOXYLEM PER MICROSCOPIC FIELD:

Observations entered in Table-16 and Photo-11 exhibit that treatments with 1 percent ether and water extracts exercise increase in number of protoxylem per microscopic field over control. However, 1 percent ether extract is comparatively more stimulatory than water extract.

Results were statistically analysed following analysis of variance method and observed effects with both 1 percent ether and water extracts are significant at 5 percent error probability.

EFFECT ON NUMBER OF ROOT HAIR PER MICROSCOPIC FIELD:

An examination of Table-16 and Photo-11 shows that treatments with 1 percent ether and water extracts mark increase in number of root hair per microscopic field over control. However, 1 percent ether extract is comparatively more beneficial than water extract.

Statistical analysis of data shows that observed increase with 1 percent ether extract is significant at 5 percent error probability.
INFLUENCE OF 6 HRS PRE-SOAKING SEED TREATMENT ON STEM:

EFFECT ON DIAMETER OF XYLEM TISSUE:

Results given in Table-17 and Photo-12 show that treatments with 1 percent ether and 2 percent water extracts exercise increase in diameter of xylem tissue over control. However, 1 percent ether extract exercises more marked effect than water extract.

Results were statistically analysed following analysis of variance method and observed increases with both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

EFFECT ON DIAMETER OF PHLOEM:

Observations entered in Table-17 and Photo-12 show that treatments with 1 percent ether and 2 percent water extracts mark increase in diameter of phloem over control. However, 1 percent ether extract is comparatively more stimulatory than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and 2 percent water extracts are insignificant at 5 percent error probability.
PHOTO - 12: EFFECT OF 6 HOURS TREATMENT WITH EXTRACTS OF *Spirodella polyrhiza* ON WHEAT STEM

CONTROL

1 PERCENT ETHER-WATER EXTRACT
EFFECT ON DIAMETER OF STEM:

A perusal of Table-17 and Photo-12 shows that treatments with 1 percent ether and 2 percent water extracts mark increase in diameter of stem over control. However, 1 percent ether extract is comparatively more beneficial than water extract.

Results were statistically analysed following analysis of variance method and observed increase with 1 percent ether extract is significant at 5 percent error probability.

EFFECT ON DIAMETER OF METAXYLEM:

An examination of Table-17 and Photo-12 exhibits that treatments with 1 percent ether and 2 percent water extracts exercise increase in diameter of metaxylem over control. However, 1 percent ether extract is more effective than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

EFFECT ON DIAMETER OF PROTOXYLEM:

Results given in Table-17 and Photo-12 show that treatments with 1 percent ether and 2 percent water extracts
exercise increase in diameter of protoxylem over control. However, 1 percent ether extract exercises more marked effect than water extract.

Results were statistically analysed and observed effects with both 1 percent ether and 2 percent water extracts are insignificant at 5 percent error probability.

**EFFECT ON NUMBER OF VASCULAR BUNDLES PER MICROSCOPIC FIELD**:

Observations entered in Table-17 and Photo-12 show that treatments with 1 percent ether and 2 percent water extracts mark increase in number of vascular bundles per microscopic field over control. However, 1 percent ether extract is comparatively more effective than water extract.

Statistical analysis of data shows that observed increases with both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

**INFLUENCE OF 12 HRS PRE-SOAKING SEED TREATMENT ON STEM**:

**EFFECT ON DIAMETER OF XYLEM TISSUE**:

Observations given in Table-17 and Photo-13 exhibit that treatments with 1 percent ether and water extracts
PHOTO - 13: EFFECT OF 12 HOURS TREATMENT WITH EXTRACTS OF *Spirodella polyrhiza* ON WHEAT STEM

CONTROL

1 PERCENT ETHER - WATER EXTRACT
exercise increase in diameter of xylem tissue over control. However, 1 percent ether extract is comparatively more beneficial than water extract.

Results were statistically analysed following analysis of variance method and observed increases with both 1 percent ether and water extracts are significant at 5 percent error probability.

**EFFECT ON DIAMETER OF PHLOEM :**

Results given in Table-17 and Photo-13 show that treatments with 1 percent ether and water extracts exercise increase in diameter of phloem over control. However, 1 percent ether extract is comparatively more effective than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and water extracts are significant at 5 percent error probability.

**EFFECT ON DIAMETER OF STEM :**

A perusal of Table-17 and Photo-13 exhibits that treatments with 1 percent ether and water extracts mark increase in diameter of stem over control. However, 1 percent ether extract is comparatively more stimulatory than water extract.
Results were statistically analysed and observed increases with both 1 percent ether and 1 percent water extracts are insignificant at 5 percent error probability.

**EFFECT ON DIAMETER OF METAXYLEM:**

An examination of Table-17 and Photo-13 shows that treatments with 1 percent ether and water extracts exercise increase in diameter of metaxylem over control. However, 1 percent ether extract is comparatively more effective than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and water extracts are significant at 5 percent error probability.

**EFFECT ON DIAMETER OF PROTOXYLEM:**

Observations entered in Table-17 and Photo-13 exhibit that treatments with 1 percent ether and water extracts exercise increase in diameter of protoxylem over control. However, 1 percent ether extract is comparatively more stimulatory than water extract.

Results were statistically analysed and observed increase with 1 percent ether extract is significant at 5 percent error probability.
EFFECT ON NUMBER OF VASCULAR BUNDLES PER MICROSCOPIC FIELD:

A perusal of Table-17 and Photo-13 shows that treatments with 1 percent ether and water extracts exercise increase in number of vascular bundles per microscopic field over control. However, 1 percent ether extract is more stimulatory than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and water extracts are significant at 5 percent error probability.

INFLUENCE OF 24 HRS PRE-SOAKING SEED TREATMENT ON STEM:

EFFECT ON DIAMETER OF XYLEM TISSUE:

Results given in Table-17 and Photo-14 show that treatments with 1 percent ether and water extracts exercise increase in diameter of xylem tissue over control. However, 1 percent ether extract is more effective than water extract.

Results were statistically analysed and observed increases with both 1 percent ether and water extracts are significant at 5 percent error probability.
PHOTO - 14: EFFECT OF 24 HOURS TREATMENT WITH EXTRACTS OF *Spirodella polyrhiza* ON WHEAT STEM

CONTROL

1 PERCENT ETHER - WATER EXTRACT
**EFFECT ON DIAMETER OF PHLOEM:**

Observations entered in Table-17 and Photo-14 exhibit that treatment with 1 percent ether and water extracts mark increase in diameter of phloem over control. However, 1 percent ether extract is comparatively more stimulatory than water extract.

Statistical analysis of data shows that observed effects with both 1 percent ether and water extracts are significant at 5 percent error probability.

**EFFECT ON DIAMETER OF STEM:**

A perusal of Table-17 and Photo-14 shows that treatments with 1 percent ether and water extracts mark increase in diameter of stem. However, 1 percent ether extract is comparatively more effective than water extract.

Results were statistically analysed and observed effects with both 1 percent ether and water extracts are significant at 5 percent error probability.

**EFFECT ON DIAMETER OR METAXYLEM:**

An examination of Table-17 and Photo-14 exhibits that treatments with 1 percent ether and water extracts exercise increase in diameter of metaxylem over control. However, 1
percent ether extract is more stimulatory than water extract.

Statistical analysis of data shows that observed increases with both 1 percent ether and water extracts are significant at 5 percent error probability.

**EFFECT ON DIAMETER OF PROTOXYLEM :**

Observations entered in Table-17 and Photo-14 exhibit that treatments with 1 percent ether and water extracts exercise increase in diameter of protoxylem over control. However, 1 percent ether extract is comparatively more stimulatory than water extract.

Results were statistically analysed and observed increases with both 1 percent ether and water extracts are significant at 5 percent error probability.

**EFFECT ON NUMBER OF VASCULAR BUNDLES PER MICROSCOPIC FIELD :**

An examination of Table-17 and Photo-14 shows that treatments with 1 percent ether and water extracts mark increase in number of vascular bundles per microscopic field over control. However, 1 percent ether extract is comparatively more beneficial than water extract.
<table>
<thead>
<tr>
<th>SOAKING PERIOD</th>
<th>DIAMETER OF XYLEM TISSUE IN μ</th>
<th>DIAMETER OF PHLOEM IN μ</th>
<th>DIAMETER OF STEM IN μ</th>
<th>DIAMETER OF METAXYLEM IN μ</th>
<th>DIAMETER OF PROTOXYLEM IN μ</th>
<th>NO. OF V. B. PER MICROSCOPIC FIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 HRS</td>
<td>C 1% EW 2% W</td>
<td>C 1% EW 2% W</td>
<td>C 1% EW 2% W</td>
<td>C 1% EW 2% W</td>
<td>C 1% EW 2% W</td>
<td>8.32 11.64 10.21</td>
</tr>
<tr>
<td></td>
<td>76.50 94.11 85.18</td>
<td>32.54 39.09 34.33</td>
<td>2882.12 3281.71 3106.81</td>
<td>34.50 44.15 42.22</td>
<td>28.38 30.17 29.43</td>
<td></td>
</tr>
<tr>
<td>12 HRS</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>9.58 12.25 11.31</td>
</tr>
<tr>
<td></td>
<td>79.28 98.31 86.39</td>
<td>35.84 44.26 38.67</td>
<td>3163.31 3528.68 3511.03</td>
<td>38.62 45.11 43.18</td>
<td>29.83 32.41 30.63</td>
<td></td>
</tr>
<tr>
<td>24 HRS</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>8.13 11.44 9.72</td>
</tr>
<tr>
<td></td>
<td>65.61 82.76 76.42</td>
<td>26.34 34.75 30.64</td>
<td>2225.63 3101.44 3000.36</td>
<td>31.71 42.34 37.51</td>
<td>25.52 29.95 29.12</td>
<td></td>
</tr>
</tbody>
</table>

C.D. = 3.23 DIFFERENCE 6 HRS
1% EW-C = 17.61 2% W-C = 8.68

C.D. = 1.71 DIFFERENCE 6 HRS
1% EW-C = 6.47 2% W-C = 1.79

C.D. = 382.58 DIFFERENCE 6 HRS
1% EW-C = 399.89 2% W-C = 224.69

C.D. = 2.93 DIFFERENCE 6 HRS
1% EW-C = 9.65 2% W-C = 7.72

C.D. = 1.98 DIFFERENCE 6 HRS
1% EW-C = 3.32 2% W-C = 1.89

DIFFERENCE 12 HRS
1% EW-C = 19.03 1% W-C = 7.11

DIFFERENCE 12 HRS
1% EW-C = 8.42 1% W-C = 2.83

DIFFERENCE 12 HRS
1% EW-C = 365.37 1% W-C = 347.72

DIFFERENCE 12 HRS
1% EW-C = 6.49 1% W-C = 4.56

DIFFERENCE 12 HRS
1% EW-C = 2.58 1% W-C = 0.80

DIFFERENCE 12 HRS
1% EW-C = 2.67 1% W-C = 1.73

DIFFERENCE 24 HRS
1% EW-C = 17.15 1% W-C = 10.81

DIFFERENCE 24 HRS
1% EW-C = 8.41 1% W-C = 4.30

DIFFERENCE 24 HRS
1% EW-C = 875.81 1% W-C = 774.73

DIFFERENCE 24 HRS
1% EW-C = 10.63 1% W-C = 5.80

DIFFERENCE 24 HRS
1% EW-C = 4.43 1% W-C = 3.60

DIFFERENCE 24 HRS
1% EW-C = 3.31 1% W-C = 1.59

Statistical analysis of data shows that observed effects with both 1 percent ether and water extracts are significant at 5 percent error probability.
EFFECT ON UPPER EPIDERMIS

INFLUENCE OF 6 HRS PRE-SOAKING SEED TREATMENT ON EPIDERMAL CELLS:

NUMBER OF EPIDERMAL CELLS PER MICROSCOPIC FIELD:

Observations entered in Table-18 and Photo-15 show that treatments with 1 percent ether and 2 percent water extracts exercise increase in number of epidermal cells per microscopic field over control. However, effect of 1 percent ether extract is comparatively more pronounced than 2 percent water extract.

Results were statistically analysed and observed increases with both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

NUMBER OF STOMATA PER MICROSCOPIC FIELD:

Results given in Table-18 and Photo-15 mark that treatments with 1 percent ether and 2 percent water extracts exercise a stimulatory effect on number of stomata per microscopic field over control. However, effect of 1 percent ether extract is comparatively more marked than 2 percent water extract.
PHOTO - 15: EFFECT OF 6 HOURS TREATMENT WITH Spirodella polymorpha EXTRACTS ON UPPER EPIDERMAL STRUCTURE OF WHEAT LEAF

CONTROL

1 PERCENT ETHER-WATER EXTRACT
Results were statistically analysed and observed increases with both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

**LENGTH OF EPIDERMAL CELL:**

A perusal of Table-18 and Photo-15 shows that treatments with 1 percent ether and 2 percent water extracts exercise an increase in length of epidermal cell over control. However, influence of 1 percent ether extract is comparatively more pronounced than 2 percent water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and 2 percent water extracts are insignificant at 5 percent error probability.

**BREADTH OF EPIDERMAL CELL:**

An examination of Table-18 and Photo-15 marks that treatments with 1 percent ether and 2 percent water extracts exercise an increase in breadth of epidermal cells over control. However, effect of 1 percent ether extract is more marked than 2 percent water extract.

Results were statistically analysed and observed increase with 1 percent ether extract is significant at 5 percent error probability.
PERIMETER OF STOMATAL PORE:

Observations given in Table-18 and Photo-15 show that treatments with 1 percent ether and 2 percent water extracts exercise increase in perimeter of stomatal pore over control. However, effect of 1 percent ether extract is comparatively more pronounced than 2 percent water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

LENGTH OF GUARD CELLS:

Results given in Table-18 and Photo-15 mark that treatments with 1 percent ether and 2 percent water extracts exercise an increase in length of guard cells over control. However, influence of 1 percent ether extract is comparatively more marked than 2 percent water extract.

Results were statistically analysed and observed increases with both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

BREADTH OF GUARD CELLS:

An examination of Table-18 and Photo-15 marks that treatments with 1 percent ether and 2 percent water extracts
exercise an increase in breadth of guard cells over control. However, influence of 1 percent ether extract is comparatively more pronounced than 2 percent water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.
INFLUENCE OF 12 HRS PRE-SOAKING SEED TREATMENT ON EPIDERMAL CELLS:

NUMBER OF EPIDERMAL CELLS PER MICROSCOPIC FIELD:

Observations entered in Table-18 and Photo-16 show that there is an increase in number of epidermal cells per microscopic field under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory towards increasing number of epidermal cells as compared to water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

NUMBER OF STOMATA PER MICROSCOPIC FIELD:

Results entered in Table-18 and Photo-16 show that there is an increase in number of stomata per microscopic field under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more effective in increasing number of stomata as compared to water extract.

Results were statistically analysed and observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.
PHOTO - 16: EFFECT OF 12 HOURS TREATMENT WITH *Spirodella polyrhiza* EXTRACTS ON UPPER EPIDERMAL STRUCTURE OF WHEAT LEAF

CONTROL

1 PERCENT ETHER - WATER EXTRACT
LENGTH OF EPIDERMAL CELL :

An examination of Table-18 and Photo-16 marks that there is an increase in length of epidermal cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract increases length of epidermal cells to larger extent as compared to water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

BREADTH OF EPIDERMAL CELL :

A perusal of Table-18 and Photo-16 shows that there is an increase in breadth of epidermal cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more effective in increasing breadth of epidermal cell as compared to water extract.

Results were statistically analysed following analysis of variance method and observed increases with both 1 percent ether and water extracts are significant at 5 percent error probability.
PERIMETER OF STOMATAL PORE:

Observations given in Table-18 and Photo-16 shows that there is an increase in perimeter of stomatal pore treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory in increasing perimeter of stomatal pore as compared to water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

LENGTH OF GUARD CELLS:

Results entered in Table-18 and Photo-16 mark that there is an increase in length of guard cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more effective as compared to water extract.

Results were statistically analysed and observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

BREADTH OF GUARD CELLS:

An examination of Table-18 and Photo-16 shows that there is an increase in breadth of guard cells under treatments
with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory as compared to water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

INFLUENCE OF 24 HRS PRE-SOAKING SEED TREATMENT ON EPIDERMAL CELLS:

NUMBER OF EPIDERMAL CELLS PER MICROSCOPIC FIELD:

Observations entered in Table-18 and Photo-17 show that there is an increase in number of epidermal cells per microscopic field under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory as compared to water extract.

Statistical analysis of data shows that observed effect of 1 percent ether extract is significant at 5 percent error probability.

NUMBER OF STOMATA PER MICROSCOPIC FIELD:

Results entered in Table-18 and Photo-17 show that there is an increase in number of stomata per microscopic
PHOTO - 17: EFFECT OF 24 HOURS TREATMENT WITH *Spirodella polyrhiza* Extracts ON UPPER EPIDERMAL STRUCTURE OF WHEAT LEAF

CONTROL

1 PERCENT ETHER - WATER EXTRACT
field under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more effective in increasing number of stomata as compared to water extract.

Results were statistically analysed and observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

**LENGTH OF EPIDERMAL CELL:**

An examination of Table-18 and Photo-17 marks that there is an increase in length of epidermal cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more effective than water extract.

Statistical analysis of data shows that observed increases with both 1 percent ether and water extracts are insignificant at 5 percent error probability.

**BREADTH OF EPIDERMAL CELL:**

A perusal of Table-18 and Photo-17 shows that there is an increase in breadth of epidermal cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more effective as compared to water extract.
Results were statistically analysed and observed increase with 1 percent ether extract is significant at 5 percent error probability.

PERIMETER OF STOMATAL PORE:

Observations given in Table-18 and Photo-17 show that there is an increase in perimeter of stomatal pore under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory in increasing perimeter of stomatal pore as compared to water extract.

Statistical analysis of data shows that observed effect of 1 percent ether extract is significant at 5 percent error probability.

LENGTH OF GUARD CELLS:

Results entered in Table-18 and Photo-17 indicate that there is an increase in length of guard cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more effective as compared to water extract.

Results were statistically analysed and observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.


<table>
<thead>
<tr>
<th>SOAKING PERIOD</th>
<th>NO. OF EPIDERMAL CELLS PER MICROSCOPIC FIELD</th>
<th>NO. OF STOMATA PER MICROSCOPIC FIELD</th>
<th>LENGTH OF EPIDERMAL CELL IN μ</th>
<th>BREADTH OF EPIDERMAL CELL IN μ</th>
<th>PERIMETER OF STOMATAL PORE IN μ</th>
<th>LENGTH OF GUARD CELLS IN μ</th>
<th>BREADTH OF GUARD CELLS IN μ</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 HRS</td>
<td>C 1% EW 2% W</td>
<td>C 1% EW 2% W</td>
<td>2.98</td>
<td>3.84</td>
<td>354.11</td>
<td>321.50</td>
<td>C 1% EW 2% W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 HRS</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>3.74</td>
<td>4.55</td>
<td>318.27</td>
<td>418.64</td>
<td>C 1% EW 1% W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 HRS</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>2.17</td>
<td>3.81</td>
<td>293.91</td>
<td>314.87</td>
<td>C 1% EW 1% W</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIFFERENCE 6 HRS</th>
<th>C.D. = 1.09</th>
<th>DIFFERENCE 6 HRS</th>
<th>C.D. = 0.58</th>
<th>DIFFERENCE 6 HRS</th>
<th>C.D. = 75.54</th>
<th>DIFFERENCE 6 HRS</th>
<th>C.D. = 1.98</th>
<th>DIFFERENCE 6 HRS</th>
<th>C.D. = 2.26</th>
<th>DIFFERENCE 6 HRS</th>
<th>C.D. = 1.40</th>
<th>DIFFERENCE 6 HRS</th>
<th>C.D. = 0.44</th>
</tr>
</thead>
<tbody>
<tr>
<td>1% EW-C = 3.26</td>
<td>1% EW-C = 1.81</td>
<td>2% W-C = 0.86</td>
<td>1% EW-C = 48.90</td>
<td>2% W-C = 16.29</td>
<td>1% EW-C = 4.53</td>
<td>2% W-C = 2.88</td>
<td>1% EW-C = 8.91</td>
<td>2% W-C = 5.22</td>
<td>1% EW-C = 2.35</td>
<td>2% W-C = 1.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2% W-C = 1.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIFFERENCE 12 HRS</th>
<th>1% EW-C = 2.50</th>
<th>1% EW-C = 1.74</th>
<th>1% EW-C = 147.08</th>
<th>1% EW-C = 6.37</th>
<th>1% EW-C = 7.33</th>
<th>1% EW-C = 9.28</th>
<th>1% EW-C = 1.63</th>
<th>1% W-C = 4.91</th>
<th>1% W-C = 0.85</th>
</tr>
</thead>
</table>

| DIFFERENCE 24 HRS | 1% EW-C = 1.49 | 1% EW-C = 1.64 | 1% EW-C = 28.24 | 1% EW-C = 3.53 | 1% EW-C = 3.74 | 1% EW-C = 9.17 | 1% EW-C = 2.11 | 1% W-C = 3.32 | 1% W-C = 0.92 |

BREADTH OF GUARD CELLS:

An examination of Table-18 and Photo-17 shows that there is an increase in breadth of guard cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more pronounced than water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.
EFFECT ON LOWER EPIDERMIS

INFLUENCE OF 6 HRS PRE-SOAKING SEED TREATMENT ON EPIDERMAL CELLS:

NUMBER OF EPIDERMAL CELLS PER MICROSCOPIC FIELD:

Observations entered in Table-19 and Photo-18 show that treatments with 1 percent ether and 2 percent water extracts exercise increase in number of epidermal cells per microscopic field over control. However, effect of 1 percent ether extract is comparatively more pronounced than 2 percent water extract.

Results were statistically analysed following analysis of variance method and observed effects of both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

NUMBER OF STOMATA PER MICROSCOPIC FIELD:

Results given in Table-19 and Photo-18 suggest that treatments with 1 percent ether and 2 percent water extracts exercise a stimulatory effect towards increase in number of stomata per microscopic field over control. However, effect of 1 percent ether extract is comparatively more marked than
PHOTO - 18: EFFECT OF 6 HOURS TREATMENT WITH *Spirodella polyrhiza* EXTRACTS ON LOWER EPIDERMAL STRUCTURE OF WHEAT LEAF

CONTROL

1 PERCENT ETHER - WATER EXTRACT
2 percent water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and 2 percent water extracts are insignificant at 5 percent error probability.

**LENGTH OF EPIDERMAL CELL:**

A perusal of Table-19 and Photo-18 shows that treatments with 1 percent ether and 2 percent water extracts exercise an increase in length of epidermal cells over control. However, influence of 1 percent ether extract is comparatively more pronounced than 2 percent water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

**BREADTH OF EPIDERMAL CELL:**

An examination of Table-19 and Photo-18 shows that treatments with 1 percent ether and 2 percent water extracts exercise increase in breadth of epidermal cells over control. However, effect of 1 percent ether extract is more pronounced than 2 percent water extract.

Results were statistically analysed and observed increases with both 1 percent ether and 2 percent water extracts are
significant at 5 percent error probability.

**PERIMETER OF STOMATAL PORE:**

Observations given in Table-19 and Photo-18 show that treatments with 1 percent ether and 2 percent water extracts increases in perimeter of stomatal pore over control. However, effect of 1 percent ether extract is comparatively more pronounced than 2 percent water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and 2 percent water extracts are insignificant at 5 percent error probability.

**LENGTH OF GUARD CELLS:**

Results given in Table-19 and Photo-18 indicate that treatments with 1 percent ether and 2 percent water extracts exercise an increase in length of guard cells over control. However, influence of 1 percent ether extract is comparatively more marked than 2 percent water extract.

Results were statistically analysed and observed increases with both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.
BREADTH OF GUARD CELLS:

An examination of Table-19 and Photo-18 shows that treatments with 1 percent ether and 2 percent water extracts exercise an increase in breadth of guard cells. However, influence of 1 percent ether extract is more pronounced than 2 percent water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

INFLUENCE OF 12 HRS PRE-SOAKING SEED TREATMENT ON EPIDERMAL CELLS:

NUMBER OF EPIDERMAL CELLS PER MICROSCOPIC FIELD:

Observations entered in Table-19 and Photo-19 show that there is an increase in number of epidermal cells per microscopic field under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory in increasing number of epidermal cells as compared to water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.
PHOTO - 19: EFFECT OF 12 HOURS TREATMENT WITH *Spirodella polyrhiza* EXTRACTS ON LOWER EPIDERMAL STRUCTURE OF WHEAT LEAF

CONTROL

1 PERCENT ETHER-WATER EXTRACT
NUMBER OF STOMATA PER MICROSCOPIC FIELD :

Results entered in Table-19 and Photo-19 show that there is an increase in number of stomata per microscopic field under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more effective in increasing number of stomata as compared to water extract.

Results were statistically analysed following analysis of variance method and observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

LENGTH OF EPIDERMAL CELL :

An examination of Table-19 and Photo-19 indicates that there is an increase in length of epidermal cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory in increasing length of epidermal cell as compared to water extract.

Statistical analysis of data shows that observed effect of both 1 percent ether and water extracts are significant at 5 percent error probability.

BREADTH OF EPIDERMAL CELL :

A perusal of Table-19 and Photo-19 shows that there
is an increase in breadth of epidermal cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more effective in increasing breadth of epidermal cell as compared to water extract.

Results were statistically analysed and observed increases with both 1 percent ether and water extracts are significant at 5 percent error probability.

**PERIMETER OF STOMATAL PORE:**

Observations given in Table-19 and Photo-19 shows that there is an increase in perimeter of stomatal pore under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory in increasing perimeter of stomatal pore as compared to water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

**LENGTH OF GUARD CELLS:**

Results entered in Table-19 and Photo-19 show that there is an increase in length of guard cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more effective as compared to water
extract.

Results were statistically analysed following analysis of variance method and observed effect of 1 percent ether extract is significant at 5 percent error probability.

**BREADTH OF GUARD CELLS:**

An examination of Table-19 and Photo-19 shows that there is an increase in breadth of guard cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory than water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

**INFLUENCE OF 24 HRS PRE-SOAKING SEED TREATMENT ON EPIDERMAL CELLS:**

**NUMBER OF EPIDERMAL CELLS PER MICROSCOPIC FIELD:**

Observations entered in Table-19 and Photo-20 show that there is an increase in number of epidermal cells per microscopic field under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract marks more stimulatory effect on number of epidermal cells as
PHOTO - 20: EFFECT OF 24 HOURS TREATMENT WITH Spirodella polyrhiza EXTRACTS ON LOWER EPIDERMAL STRUCTURE OF WHEAT LEAF

CONTROL

1 PERCENT ETHER - WATER EXTRACT
compared to water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

**NUMBER OF STOMATA PER MICROSCOPIC FIELD:**

Results entered in Table-19 and Photo-20 show that there is an increase in number of stomata per microscopic field under both 1 percent ether and water extracts. However, 1 percent ether extract is more effective in increasing number of stomata as compared to water extract.

Results were statistically analysed and observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

**LENGTH OF EPIDERMAL CELL:**

An examination of Table-19 and Photo-20 shows that there is an increase in length of epidermal cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory as compared to water extract.

Statistical analysis of data shows that observed increases with both 1 percent ether and water extracts are significant
at 5 percent error probability.

**BREADTH OF EPIDERMAL CELL:**

A perusal of Table-19 and Photo-20 shows that there is an increase in breadth of epidermal cells under both 1 percent ether and water extracts. However, 1 percent ether extract is more effective towards imparting increase in breadth of epidermal cells as compared to water extract.

Results were statistically analysed following analysis of variance method and observed increases with both 1 percent ether and 2 percent water extracts are significant at 5 percent error probability.

**PERIMETER OF STOMATAL PORE:**

Observations given in Table-19 and Photo-20 show that there is an increase in perimeter of stomatal pore under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory than water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and water extracts are insignificant at 5 percent error probability.
<table>
<thead>
<tr>
<th>SOAKING PERIOD</th>
<th>NO. OF EPIDERMAL CELLS PER MICROSCOPIC FIELD</th>
<th>NO. OF STOMATA PER MICROSCOPIC FIELD</th>
<th>LENGTH OF EPIDERMAL CELL IN μ</th>
<th>BREADTH OF EPIDERMAL CELL IN μ</th>
<th>PERIMETER OF STOMATAL PORE IN μ</th>
<th>LENGTH OF GUARD CELLS IN μ</th>
<th>BREADTH OF GUARD CELLS IN μ</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 HRS</td>
<td>C 1% EW 2% W</td>
<td>C 1% EW 2% W</td>
<td>C 1% EW 2% W</td>
<td>C 1% EW 2% W</td>
<td>C 1% EW 2% W</td>
<td>C 1% EW 2% W</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24.13 26.34 26.11</td>
<td>3.73 4.53 4.38</td>
<td>261.43 291.21 285.44</td>
<td>25.61 30.37 28.71</td>
<td>30.47 31.41 30.93</td>
<td>78.24 82.34 81.41</td>
<td>5.84 7.34 6.9</td>
</tr>
<tr>
<td>12 HRS</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.71 28.45 27.17</td>
<td>3.83 5.65 4.94</td>
<td>282.41 318.46 311.54</td>
<td>32.47 35.13 34.48</td>
<td>30.96 35.71 33.41</td>
<td>79.41 85.68 81.74</td>
<td>6.12 7.97 7.3</td>
</tr>
<tr>
<td>24 HRS</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td>C 1% EW 1% W</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22.14 24.43 23.35</td>
<td>2.36 4.24 4.11</td>
<td>250.42 281.41 275.47</td>
<td>25.40 29.43 27.25</td>
<td>29.91 31.22 30.80</td>
<td>78.17 80.34 79.41</td>
<td>5.63 6.89 6.7</td>
</tr>
</tbody>
</table>

C.D. = Critical Difference

DIFFERENCE

6 HRS
1% EW-C = 2.21
2% EW-C = 1.98

12 HRS
1% EW-C = 2.74
1% W-C = 1.46

24 HRS
1% EW-C = 2.29
1% W-C = 1.21

LENGTH OF GUARD CELLS:

Results entered in Table-19 and Photo-20 show that there is an increase in length of guard cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more effective in increasing length of guard cells as compared to water extract.

Results were statistically analysed following analysis of variance method and observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.

BREADTH OF GUARD CELLS:

An examination of Table-19 and Photo-20 shows that there is an increase in breadth of guard cells under treatments with both 1 percent ether and water extracts. However, 1 percent ether extract is more stimulatory towards increasing breadth of guard cells as compared to water extract.

Statistical analysis of data shows that observed effects of both 1 percent ether and water extracts are significant at 5 percent error probability.