NUTRIENT UPTAKE BY WHEAT AND PHALARIS MINOR AS INFLUENCED BY WEED MANAGEMENT PRACTICES

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ABSTRACT
A field experiment was conducted during Oct.-April 1998 and 1999 to evaluate the effect of time of sowing, cultivars, row spacing and weed control measure on the uptake of nutrients by P. minor and the availability of nutrients to the crop. Early sowing (25th Oct.), closer row spacing (15 cm) significantly decreased the nutrient removal by the P. minor compared with later sowing (10th Nov. and 25th Nov.) and wider row spacing (22.5 cm) respectively and thus resulted in higher nutrient uptake by the crop due to lesser dry matter production of P. minor. Uncontrolled weeds at harvest stage depleted on average 28.6, 4.2 and 44.4 kg N, P and K/ha. Isoproturon 0.94 kg/ha reduced the nutrient removal by the P. minor leading to increase in nutrient uptake by the crop.

With the introduction of dwarf high input responsive wheat varieties, infestation of Phalaris minor had increased (Malik et al., 1998). It severely competes with the crop for nutrient. Khera et al. (1995) reported that nitrogen use efficiency of the crop was greatly reduced in the presence of Phalaris minor. In another estimate, Mukhopadhyay and Bera (1980) observed that weeds removed 28 kg N, 3 kg P and 28 kg K/ha from a wheat field, resulting in a 10% reduction in the grain yield of wheat. Presence of weeds in actively growing crop interferes with the efficiency of fertilizer utilization by the crop plants. So the control of weeds is vitally important not only to check the losses caused by weeds but also to increase the efficiency of fertilizer applied to the wheat crop. The present investigations were aimed to find out the effect of time of sowing, selection of quick growing cultivars, modifying row spacing and weed control measure in order to create better environmental conditions for wheat to grow and realize its genetic potential and restrict the weed growth.

Studies were conducted during Oct.-April 1998 and 1999 at the Agronomy Farm, P.A.U., Ludhiana, India. Experiment was conducted in split-plot design with three date of sowing (25th Oct., 10th Nov. and 25th Nov.) in the main plot; and two varieties (PBW-343 and WH-542), two row spacing (15 cm and 22.5 cm) and two weed control measure (Unweeded check and Isoproturon 0.94 kg/ha) in sub plots: treatments were replicated four times. The soil of the experimental field was of loamy sand in texture and rated as low in available nitrogen, O.C. and medium in phosphorus and potassium with pH of 8.1. N (125 kg/ha) was applied in two equal splits, basally and top dressed after first irrigation; 60 kg P₂O₅ and 30 kg K₂O/ha were applied just before sowing. Isoproturon 0.94 kg/ha was applied 35 days after sowing in a spray volume of about 500 l/ha. With the help of Knapsack spray pump fitted with flat fan nozzle. Nitrogen, phosphorus and potassium in wheat and weeds were estimated at harvest with modified micro-Kjeldahl method, molybdovanado-phosphoric yellow colour method and flame photometry, respectively, Jackson (1973). Total uptake of nutrients by wheat (grain and straw) and weeds were calculated by multiplying the % content of these nutrients with the dry matter values. The data collected were subjected to statistical analysis (Gomez and Gomez, 1984).

Effect of treatments on the crop: A perusal of data in Table 1 showed that uptake of N and P by the wheat crop (grain + straw) was maximum under 25th Oct. sowing which was 33% and 16.5% more when compared with 10th Nov. and 25th Nov. sowing crop
Table 1. Total uptake of N, P and K by wheat (grain + straw) as affected by different treatments

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Uptake (kg/ha)</th>
<th>1998</th>
<th>1999</th>
<th>Mean</th>
<th>1998</th>
<th>1999</th>
<th>Mean</th>
<th>1998</th>
<th>1999</th>
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<td>Phosphorus</td>
<td>Potassium</td>
<td>Date of sowing</td>
<td>Nitrogen</td>
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<td>Potassium</td>
<td>Date of sowing</td>
<td>Nitrogen</td>
<td>Phosphorus</td>
</tr>
<tr>
<td>25th Oct.</td>
<td>109.02</td>
<td>109.82</td>
<td>109.42</td>
<td>19.56</td>
<td>20.71</td>
<td>20.13</td>
<td>134.77</td>
<td>133.39</td>
<td>134.08</td>
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<tr>
<td>10th Nov.</td>
<td>91.31</td>
<td>99.95</td>
<td>95.63</td>
<td>16.05</td>
<td>17.42</td>
<td>16.73</td>
<td>134.10</td>
<td>136.33</td>
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<tr>
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<td>81.56</td>
<td>76.48</td>
<td>11.84</td>
<td>13.57</td>
<td>12.70</td>
<td>101.82</td>
<td>110.29</td>
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<td>4.49</td>
<td>0.92</td>
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<td>0.95</td>
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<tr>
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<td>94.65</td>
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<td>17.61</td>
<td>16.88</td>
<td>125.95</td>
<td>129.43</td>
<td>127.69</td>
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<td>93.03</td>
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<td>96.09</td>
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<td>0.38</td>
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<td>97.22</td>
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<td>17.27</td>
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<td>124.07</td>
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Table 2. Total removal of N, P, and K by Phalaris minor as affected by different treatments

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<th>Treatments</th>
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<th>1999</th>
<th>Mean</th>
<th>1998</th>
<th>1999</th>
<th>Mean</th>
<th>1998</th>
<th>1999</th>
<th>Mean</th>
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<td>Phosphorus</td>
<td>Potassium</td>
<td>Date of sowing</td>
<td>Nitrogen</td>
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<td>Potassium</td>
<td>Date of sowing</td>
<td>Nitrogen</td>
<td>Phosphorus</td>
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<td>25.80</td>
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<td>4.57</td>
<td>4.11</td>
<td>38.88</td>
<td>42.31</td>
<td>40.59</td>
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<td>35.06</td>
<td>34.35</td>
<td>4.95</td>
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<td>3.17</td>
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<td>0.70</td>
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<td>NS</td>
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<td>15 cm</td>
<td>23.14</td>
<td>25.15</td>
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<td>3.50</td>
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<tr>
<td>Unweeded check</td>
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<td>29.98</td>
<td>28.61</td>
<td>3.84</td>
<td>4.65</td>
<td>4.24</td>
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<tr>
<td>IPU 0.94 kg/ha</td>
<td>24.50</td>
<td>25.39</td>
<td>24.94</td>
<td>3.75</td>
<td>3.90</td>
<td>3.82</td>
<td>40.90</td>
<td>42.75</td>
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<td>1.82</td>
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<td>NS</td>
<td>2.83</td>
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</table>

respectively. While, K removal was maximum under 10th Nov. sowing. Greater nutrient uptake by the crop in the early sowing (25th Oct.) due to greater suppression of Phalaris minor as reflected in lesser dry matter production (Table 3) because of dense and early canopy of the crop which help in smothering the Phalaris minor. The uptake of nutrients in var. PBW-343 was significantly more due to better crop growth in terms of dry matter production (Grain + Straw) than variety WH-542. The crop on average removed 96.0, 16.9 and 121.0 kg N,
Table 3. Grain yield, Straw yield and dry matter production of *Phalaris minor* (q/ha) at harvest stage as affected by different treatments

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Grain yield (q/ha)</th>
<th>Straw yield (q/ha)</th>
<th>Dry matter of <em>Phalaris minor</em> (q/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1998</td>
<td>1999</td>
<td>Mean</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25&lt;sup&gt;th&lt;/sup&gt; Oct.</td>
<td>47.2</td>
<td>50.9</td>
<td>49.05</td>
</tr>
<tr>
<td>10&lt;sup&gt;th&lt;/sup&gt; Nov.</td>
<td>37.3</td>
<td>41.8</td>
<td>39.55</td>
</tr>
<tr>
<td>25&lt;sup&gt;th&lt;/sup&gt; Nov.</td>
<td>30.0</td>
<td>35.6</td>
<td>32.8</td>
</tr>
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<td>45.5</td>
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<tr>
<td>CD (0.05)</td>
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</tbody>
</table>

Figures in parentheses are means of original value. Data subjected to $\sqrt{x+1}$ transformation.

P and K/ha at closer row spacing compared with 91.6, 16.0 and 121.1 kg/ha at wider row spacing of 22.5 cm (Table 1). These observations suggest that *P. minor* removed more N and P at wider spacing in comparison with closer row spacing and resulted in less nutrient uptake by the crop at wider row spacing. It can be inferred that the wheat canopy covered the ground more rapidly in closer rows than in wider rows; suppression of early weed growth in closer rows resulted in less weed growth. Hence, the nutrient removed by the crop in this treatment was higher than in wider row. The K uptake was more under wider row spacing because K content in straw and significantly more straw yield was observed than the closer row spacing (Table 3). On average, the uptake of N and P by the crop in the isoproturon treated plot was 97.2 and 17.2 which was 7.4 and 9.5% more than the crop in weedy conditions. Isoproturon at 0.94 kg/ha led to higher uptake of N and P, because it provided more appropriate spacing between the crop plants for better utilization of available nutrients.

**Effect of treatments on Phalaris minor.** As revealed from the data presented in Table 2 it was observed that removal of N, P and K by *P. minor* was maximum under 10<sup>th</sup> Nov. sowing when compared with 25<sup>th</sup> Oct. and 25<sup>th</sup> Nov. sowing due to more dry matter production of *P. minor*. The *P. minor* in 25<sup>th</sup>
Oct. sowing on average removed 25.8, 4.1 and 40.5 kg N, P and K/ha compared with 34.3, 5.0 and 55.4 kg/ha under 10th Nov. sowing due to less accumulation by P. minor under 25th Oct. sowing (Table 2 and 3). Under both the varieties (PBW-343 and WH-542) the P. minor removed equal amount of nutrients as the differences were non-significant. On average the uptake of N, P and K by P. minor under closer spacing was 24.1, 3.8 and 38.5 which was 22.0, 10.5 and 23.6% less than under wider row spacing. This indicate that due to greater suppression of P. minor by dense vegetative growth of crop row spacing which resulted in significantly less removal of nutrients than under wider row spacing. The uptake of N, P and K by P. minor was highest in weedy plots and was least in plots treated with isoproturon 0.94 kg/ha. It was also observed that isoproturon was moderate in its effect on weed control. Application of isoproturon led to 14.8% and 6.2% less removal of N and K by P. minor. So, there can be net saving of nutrient cited above if the growth of P. minor suppressed efficiently in wheat.

REFERENCES