Effect of different mole spacings on the yield of summer groundnut

O.L. KOLEKAR, S.A. PATIL, S.B. PATIL AND S.D. RATHOD

ABSTRACT

The research work carried out earlier has shown the effective installation of mole drains at various depths. The effect of mole drainage system on the crop parameters are studied on summer groundnut. The mole plough manufactured last year studied and evaluated for its performance at various depths. The effect of the mole plough developed needs to be studied from the crop point of view so the present study was undertaken to study the effect of mole drains spacing on summer groundnut yield. A tractor 65 HP was selected to make drains of 2m, 4m and 6m. The effect of mole drain spacing at 2 m, 4 m and 6m plot without drain i.e. control were studied by standard procedure and following conclusions were made. The plant height, number of branches per plant, number of pods per plant, weight of pods per plant were highest in 4 m drain spacing followed by 6m, 2m and control plot. The total yield of groundnut was highest in 4m mole spacing followed by 6m, 2m and control and the total yield in 4m drain was 69.20% more than the control.

Key words: Mode drains, Mole drainage system
qualitatively fit for irrigation through direct application or conjunctive use vertical drainage has been extensively done for lowering of the water table and augmentation of canal supply.

A large number of tube wells have also been installed in Punjab, Bihar, Uttar Pradesh and other states to lower water table. These schemes have also served the purpose of conjunctive use of surface and ground waters.

**Mole drainage:**

Mole drains are unlined circular soil channels, which function like pipe drains. Mole drainage is an effective method of drainage, which is widely used in the clay soils of temperate region such as United Kingdom, northern Europe and in New Zealand. It is generally confined to soils having clay content of about 30-35%. Their diced is their restricted life (5 to 10 years), but, providing benefit cost ratios are favourable, a short life can be acceptable. Mole drains are formed with a mole plough, which comprises a cylindrical foot attached to a narrow leg, followed by a slightly larger diameter cylindrical expander. The foot and expander from the drainage channel and the leg generator the shot with associated soil fissures which extend from the surface down into the channel. The leg fissures are vertical and formed at an angle of approximately $45^\circ$ to the direction of travel.

Mole drains are commonly installed at depths between 0.4 and 0.7 m, but can be installed up to depth of 1.2 m. The mole drain spacing ranges between 2 to 5 m. Common lengths of mole drains vary from 20 m to 100 m long depending on the grade, which may range from nearly level to 5 per cent. Mole drains are installed using a mole plough, pulled by a powerful tractor (drawbar pull 40-60 KN). The success of a mole drainage system is dependent upon satisfying two requirements achieving the desired water flow path for the particular drainage situation, and installing stable mole channels. Hence following are the objectives to study the effect of mole drainage system at various spacing on the plant height, number of branches per plant, number of pods per plant, weight of pods per plant and total yield of summer groundnut and comparison of different crop parameters of summer groundnut at the different spacing of mole drain.

**METHODOLOGY**

**Field layout:**

An experimental layout of mole drains was prepared with three different spacing (2, 4 and 6 m) and five supplications with 2m buffer strip.

In the area of 44 x 40m, 3 laterals of each spacing i.e. 2, 4 and 6 m were installed. Putting a space of 1 x 40m at the starting of the plot drains of 2, 4 and 6m were separated by the area of 3 x 40, 5 x 40 and 60 x 40m successive, adjust to this plot a control plot of 6 x 40 was also separated by a 2 x 40m buffer strip.

**Selection of site and soil condition:**

**Moisture content in soil:**

Usually when the clay at mole draining depth has moisture content of 20-30% conditions are satisfactory. The tests were conducted in the field when the moisture content was 26%.

**Topography:**

The mole channel constructed need to be graded either during mole plough or by selection of inclined field topography for efficient disposal of drained water. A field with average slope of 1.5% was selected and moling operation was planned along the slope of the field starting from lower end to upper end.

**Selection of different parameters for mole drainage system:**

**Spacing of drains:**

The spacing of mole drains varies from 2 to 5 m in the experiments conducted in U.K. and New Zealand. However, it depends on the soil permeability and the necessity of drainage also. If the spacing is less than 2 m, there is a danger of damage of the previously constructed drain where as if the spacing is greater than 5 m the fissuring effect may not cover the intervening space. So the 2 m, 4 m and 6 m spacing between the mole channels was selected for the study.

**Depth of drains:**

A rule of thumb is that the expander to mole draining depth is 1:7. As the diameter of expander selected was 85 mm. The depth of drains was planned up to 70 cm.

**Length of drains:**

The length of mole channels depends on the grade of the mole drains formed, soil type, shape, size and topography of the field. Flat slope requires shorter drain. Generally adopted/accepted maximum effective length of moles is 200 m. However, moles up to 400 m pulled at Cooriemungle in South, West Victoria have performed satisfactorily for a number of years. However, shorter (80-100 m) moles should last longer because they empty out quicker and are not likely to be overloaded. So 100 m length of drain was selected.
Selection of tractors:
As the mole plough needs to work at greater depths of 60 to 75 cm which requires higher power to pull the plough. The higher horse power tractors are readily available in the market and purchased by the farmers, keeping this in a view a 65 HP tractor was selected for the formation of moles.

Measurement of different parameters selected in the study:

Soil moisture content:
For measurement of soil moisture content, core samples of soil were taken at different locations of test plot selected randomly were collected in the sample boxes. These boxes were oven dried in a hot air oven at 105°C for 24 hours. At the end of 24 hour weight of sample boxes with dry soil and weight of empty boxes were taken. The soil moisture content was calculated by using the formula:

\[ MC = \left( \frac{W_1 - W_2}{W_2} \right) \times 100 \]

where,
MC = moisture content, per cent (dry basis)
W₁ = weight of moist soil sample, kg and
W₂ = weight of dry soil sample, kg.

Bulk density:
It is the mass of oven-dried soil per unit volume. For measurement of bulk density of soil, a cylindrical core sample (100 x 120 mm) was taken and soil samples were taken at different locations in a plot. Core sample was kept in air oven for 24 hour and after 24 hours weight of soil sample was taken with electrical balance. Bulk density was calculated by using following formula:

\[ BD = \frac{M}{V} = \frac{4M}{\pi D^2 L} \]

where,
BD = bulk density, kg/m³
M = mass of soil sample contained in the core sample, kg.
V = volume of core sample m³
D = diameter of cylindrical core sample, m
L = length of cylindrical core sample, m

RESULTS AND DISCUSSION
The results of the present study as well as relevant discussion have been summarized below:

Biometric and yield contributing characteristics of groundnut crop:
Biometric and yield contributing characteristics were found very good at mole spacing of 4 m than 6 m, 2 m and control. This may be due to the spacing of 4 m have the right amount of water to the plant and remaining water was easily drain off.

At 6 m mole spacing their was slow rate off of the water because of spacing was too large. At 2 m mole spacing their was higher rate of drainage of water because of spacing is too small. At control it was found ponding of water because of clay content in the soil. From the Table 1 it can be seen that biometric and yield contributing characteristics were better in mole drain plot as compared to control. The highest yield was obtained from 4 m spacing of the drain than 6 m and 2 m spacing. Control had lowest yield.
It is clear from Table 1 that the average yield was 26.096 q/ha in 4m spacing while it was 20.884 q/ha and 19.06 q/ha in 6 m and 2 m spacing, respectively. Control had lowest yield of 18.02 q/ha. It was found that there was no significant difference in yield of 2m, 4m and 6m spacing, higher the spacing, lower will be cost of installation therefore, the spacing of 4 m can be adopted in the region of Digraj, Dist. Sangli.

**Conclusion:**

The plant height, number of branches per plant, number of pods per plant, weight of pods per plant was highest in 4 m drain spacing followed by 6m, 2m and control plot. The total yield of groundnut was highest in 4m mole spacing followed by 6m, 2m and control and the total yield in 4m drain was 69.20% more than the control. This might be due to the reason that, the area with 2m spacing of drains was over drained due to close spacing of drains where as the an area with 6m drain spacing was under drained due to wide spaced mole drains.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Characteristics</th>
<th>2 m</th>
<th>4 m</th>
<th>6 m</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Height of plants (cm)</td>
<td>22.69</td>
<td>25.32</td>
<td>24.32</td>
<td>22.14</td>
</tr>
<tr>
<td>2.</td>
<td>No. of branches per plant</td>
<td>2</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>No. of pods</td>
<td>9</td>
<td>11</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>4.</td>
<td>Weight of pods per plant (g)</td>
<td>11</td>
<td>14</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Total yield of dry pods (q/ha)</td>
<td>19.065</td>
<td>26.096</td>
<td>20.884</td>
<td>18.02</td>
</tr>
</tbody>
</table>

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