International Journal of Agricultural Engineering, Vol. 4 No. 1 (April, 2011) : 82 -85

Research Paper :

Effect of different mole spacings on the yield of summer groundnut

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

Received : February, 2011; Accepted : March, 2011

See end of the article for authors' affiliations

Correspondence to:

O.L. KOLEKAR
Department of Farm Machinery and Power, College of Agricultural Engineering and Technology, Marathwada Agricultural University, PARBHANI (M.S.) INDIA

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.

Kolekar, O.L., Patil, S.A., Patil, S.B. and Rathod, S.D. (2011). Effect of different mole spacings on the yield of summer groundnut. *Internat. J. Agric. Engg.*, **4**(1) : 82-85.

Key words : Mode drains, Mole drainage system

National commission on Agriculture, Govt. of India (NCA. 1976) defined an area as waterlogged when the water table causes saturation of crop roof soil resulting to restriction to air circulation, decline in oxygen and increase in co_2 levels.

The physical effects of water logging are lack of aeration in the crop root zone, difficulty in soil workability and deterioration of soil structure. Its chemical effect is soil salination.

Present status of drainage:

The effects of water logging were observed in the Western Yamuna Canal zone around 1850 AD. In the Deccan plateau, where the Neera irrigation project was commissioned in 1984, water logging started with a few years of starting irrigation.

In many coastal areas excessive groundwater exploitation has caused seawater intrusion, worsening the salinity problem. There are extensive low lying areas in the rice growing coastal belts of eastern and south eastern region of India where poor drainage seriously affects crop production in the mansoon season.

Different types of drainage system and their cost economics:

The methods can be adopted for reclaiming waterlogged and salt affected areas are surface drainage, subsurface drainage, vertical and biological drainage.

Structural measures are summarized as surface, sub surface (ground water or tile drainage) and mole drainage.

Surface drainage:

Surface drainage can be described as (ASAE, 1979) "the removal of excess water from the soil surface in time to prevent damage to crops and to keep from pounding on the soil surface, or in surface drain that are crossed by farm equipment without causing soil erosion."

Subsurface drainage:

Subsurface drainage (SSD) is the removal of excess of soil in time to prevent damage to the crops because of a high ground water table. Subsurface field drains can be either open ditcher or pip drains pipe drains are installed underground at depths varying from 1 to 3 m. Excess groundwater excess the perforated field drain and flows by gravity to the open or closed collector drain.

Vertical drainage:

In this method tube well, are to be drilled to lower the ground water table where adequate permeability of soil between the crop roof zone and aquifer are available. Vertical drainage is useful where pumped water is

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 45^0 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 amd 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 6m) 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 susceptive, 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 105^0 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 :

$$MC = \frac{W_1 - W_2}{W_2} \times 100$$

where,

MC = moisture content, per cent (dry basis)

W_1 = weight of moist soil sample, kg and

W_2 = 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/m^3

M = mass of soil sample contained in the core sample, kg.

V =volume of core sample m^3

D = diameter of cylindrical core sample, m

L = length of cylindrical core sample, m

Measurement of different parameters:

This section deals with different measurement techniques used for measuring various parameters in the study.

Plant height:

An area of 5 m x 2 m was selected and 5 plants were selected randomly. Plant height was measured with the help of scale from ground level to the top of leaf of plant.

Number of branches per pant:

An area of 5 m x 2 m was selected and 5 plants were selected randomly. Plant branches were counted manually.

Number of pods per pant:

An area of 5m x 2 m was selected, randomly and five plants were selected from that area. From the selected plants, the number of ponds of each plant was computed. Then by adding all pods of all five plants, total number of pods was recorded. The average value of number of pods was taken from five such readings.

Weight of pods yield per plant:

An area of 5m x 2 m was selected, randomly and five plants were selected from that area. From the selected plants, the weight of pods of each plant was computed. Weight of pods was taken with the help of electronic balance.

Total yield of dry pods:

After harvesting the yield of dry pods was weighted with electronic balance and calculated total yield in q/ha.

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 6m, 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.

Table 1 : Biometric and yield contributing characteristics of groundnut crop

Sr. No.	Characteristics	2 m	4 m	6 m	Control
1.	Height of plants (cm)	22.69	25.32	24.32	22.14
2.	No. of branches per plant	2	7	6	5
3.	No. of pods	9	11	10	8
4.	Weight of pods per plant (g)	11	14	12	10
5.	Total tield of dry pods (qt/ha)	19.065	26.096	20.884	18.02

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.

Authors' affiliations:
S.A. PATIL, Department of Soil and Water Conservation Engineering, Dr. A.S. College of Agricultural Engineering, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA
S.B. PATIL, Department of Farm Machinery and Power, College of Agricultural Engineering and Technology, TALSADE (M.S.) INDIA
S.D. RATHOD, National Agricultural Research Centre, Kasabe Digraj, SANGALI (M.S.) INDIA

REFERENCES

ASAE, Surface drainage committee (1979). Design and construction of surface drainage system on farms in humid areas. Engineering Practice EP 302.2. American society of agricultural engineers, Michigan, 9p.

———— *** ————