

## Effect of Earthing up Procedure on Enhancement in Yield of Different Groundnut Varieties Planted under Agro-Climatic Conditions of Malakand Division

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### Abstract

Studies were carried out on various groundnut varieties which develop aerial pegs at the Agriculture Research Institute (N) Mingora, Swat during 2003-04 to find out whether the practice of earthing up and covering of the aerial pods could enhance yield. Based on yield and yield components data, it was concluded that those varieties in which earthing up was made i.e. ICGS-234, Parachinar and PI-924629 had maximum pods plant<sup>-1</sup>, 100 kernel weight, 20 pods length and pod yield as compared to check variety 429411 where no earthing up was applied. It is therefore concluded that the earthing up practice among those varieties which develop aerial pegs may boost up the pod yield.

### Introduction

Groundnut (*Arachishypogaea. L.*) belongs to an important family leguminosae. It is an oilseed crop with 40-50% oil contents. The remaining portion can be used as meal for food or feed (25-30% proteins). As a crop groundnut ranks 13<sup>th</sup> in importance in the world. Groundnut is grown on nearly 23.95 million ha worldwide with the total production of 36.45 million tons and an average yield of 1520 kg ha<sup>-1</sup> (FAOSTAT, 2011). In Pakistan it was grown on an area of 83000 hectares with a total production of 68000 tons and an average yield of 818 kg ha<sup>-1</sup>. (G.O.P, 2011). In Khyber Pakhtunkhwa during the same period it was grown on an area of 7839 ha with a total production of 11151 tons and an average yield of 1422 kg ha<sup>-1</sup>. (G.O.P, 2011). Groundnut is a potential crop for both rain-fed and irrigated lands of Malakand Division and can easily be adjusted in the prevailing cropping patterns. The peg penetration in case of loose soil is much easier in groundnut (Underwood et al, 1971). The fruit develops on pegs underground but most of the pegs do not penetrate the soil and require to be covered through the process of earthing up. Earthing up is the raising of the soil around the plant in order to cover the pegs (Mhungu and Chiteka, 2010). Peg Penetration is affected by the soil bulk density but as well as it depends upon the peg length as in many cases the pegs are not long enough to penetrate the soil. Swanevelder (1998) reported earthing up has a positive influence on the groundnut yield. Fleissner (2001) considered earthing up as an indispensable practice in the production of Bambara groundnut.

Some groundnut varieties have aerial pods, which do not set any seed, and thus the yield is considerably reduced. Major constraints leading to low yield are low soil fertility and use of improper agronomic practices as a result of lack of knowledge of the appropriate timing of earthing up (Madamba, 1997). Earthing up of these pods at proper time may minimize the yield losses. Considering the possible role of aerial podding varieties in enhancing groundnut productivity, the information on earthing up is scarce. The aerial podding of groundnut was first reported by Prasad (1985). The aerial pegs which otherwise go waste without developing into pods, may be converted into productive pods with good seed filling, by earthing up operation. (Prasad and Muralidharudu, 1991). Three earthing up periods – 2 WAS (two weeks after sowing), 4 WAS and 7 WAS – were combined with two landraces. Earthing up procedure at 2 and 7 WAS led to the highest seed yield across the two years (Ouedraogo et al. 2012). Crop performance at 22 plants m<sup>-2</sup> on a flat seedbed, earthened at weeding, was generally superior as it gave the highest ( $P \leq 0.05$ ) pod yield (798 kg ha<sup>-1</sup>), grain yield (585.1 kg ha<sup>-1</sup>), and harvest index (75.0) Mkandawire and Sibuga (2002).

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The present study is aimed to investigate whether earthing up operation can increase pod yield of groundnut genotypes. It was also conducted to select most desirable variety/varieties for rain-fed as well as irrigated lands of Malakand Division.

### Materials and Methods

The earthing up trial of different groundnut varieties was conducted during the year 2001-2 and repeated during 2003-04 at ARI, Mingora, Swat. Seed of different aerial podding varieties (from bunch and runner types) were obtained from AARI, Chakwal. The field was thoroughly prepared and fertilizer at the rate of 20:60:60 kg NPK ha<sup>-1</sup> was applied before sowing. The experiment was laid out in randomized complete block design with three replication and 4 treatments with plot size of 4 x 1.8 m or 7.2 m<sup>2</sup> i.e. 4 rows, 4 meter long with spacing of 45 cm. Plant to plant distance was kept 20 cm, with a sowing depth of 2-3 cm. Sowing was done, using Kera method. The earthing up operation was conducted at the time of first flower emergence in the varieties. For this purpose earthing up of the plant was done to encourage peg penetrations. All recommended cultural practices and plant protection measures were adopted to raise a good crop. Three irrigations were applied during the whole cropping season. Digging of the pods was started at maturity. The plants from each plot were labeled and kept separated. The pods were collected and yield data in kg ha<sup>-1</sup> were recorded. The average seed yield and other relevant data on different varieties were collected as according to standard procedure.

### Results and Discussion

#### 1. Pods Plant<sup>-1</sup> and 100 Kernel Weight (gm)

Data on pods plant<sup>-1</sup> and 100 kernel weight (gm) is presented in table-1. Pods per plant revealed significant differences at ( $P \leq 0.05$ ). It is evident from the data that maximum pod plant<sup>-1</sup> of 77.2 were recorded for variety Parachinar, followed by variety ICGS-234 with 76.6 pods, while minimum pods plant<sup>-1</sup> of 44.5 were recorded for variety 429411 (check). Data on 100 kernel weight also revealed significant differences at ( $P \leq 0.05$ ). It is evident from the average data recorded that maximum 100 kernel weight (74.4 gm) and (72.1 gm) was recorded for varieties ICGS-234 and Parachinar, while minimum 100 kernel weight (57.6 gm) was recorded for variety 429411 (check). Variation among pods plant<sup>-1</sup> and 100 kernel weight may largely be due to earthing up operation. Those varieties in which earthing operation was performed had maximum Pods Plant<sup>-1</sup> and 100 kernel weight as compared to check variety where no earthing up was done. The increase in yield may be due to covering of stem above the soil surface with earthing up procedure which ease up the process of pegs penetration. This variation may also be due genetic characteristics of these varieties. The results are in agreement with Prasad and Muralidharudu, 1991, Mkandawire and Sibuga 2002 and Ouedraogo et al. 2012.

**Table-1: Effects of Earthing up on pods plant<sup>-1</sup> and 100 kernel weight (gm) of Groundnut Varieties**

S. No.	Varieties	Pods plant <sup>-1</sup>	100 Kernel wt. (gm)
1	Parachinar	77.2 A	72.1 A
2	ICGS-234	76.6 A	74.4 A
3	PI-429629	51.6 B	63.4 AB
4	429411 (Check)	44.5 B	57.6 B
LSD value at ( $P \leq 0.05$ )		17.7	11.8

#### 2. Sound Mature Kernel (SMK %) and 20 Pods Length (cm)

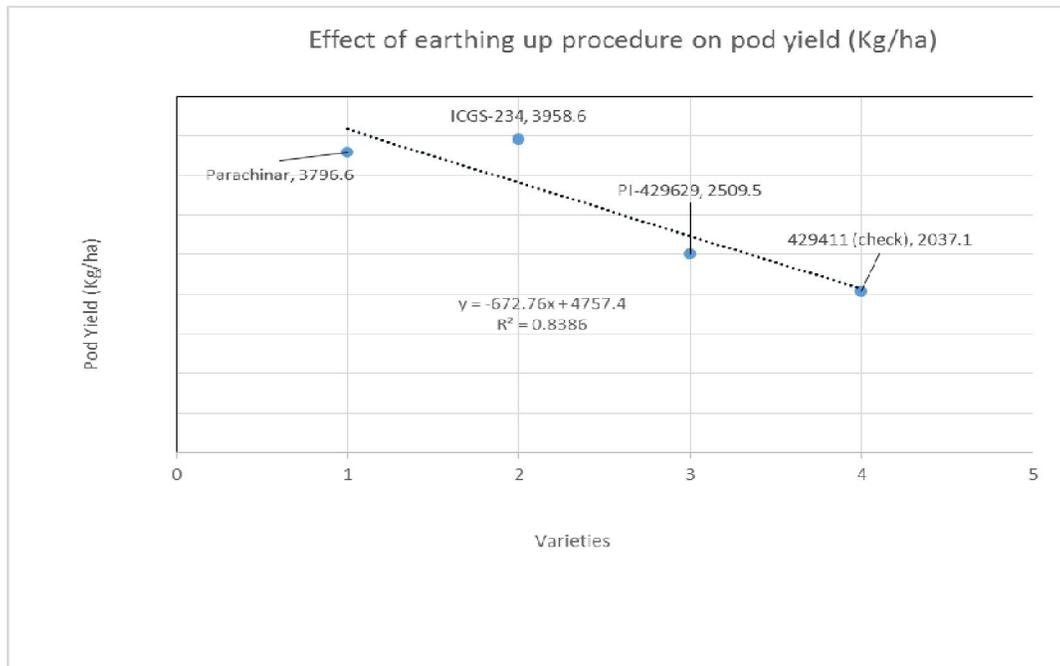
Data on sound mature kernel % and 20 pods length is presented in table-2. Sound mature kernel (SMK %) remained non-significant ( $P \leq 0.05$ ). Data on 20 pods length showed significant differences at ( $P \leq 0.05$ ). The average data showed that maximum 20 pods length of 73.7 cm and 69.4 cm was recorded for varieties ICGS-234 and Parachinar, while minimum 20 pods length of 49.6 cm was recorded for check variety 429411. Earthing up operation is likely to be the caused of this variation in 20 pods length. Those varieties in which earthing operation was performed had maximum 20 pods length as compared to check variety where no earthing up was done. Genetic character of each variety may also play a role for this variation.

**Table-2: Effects of SMK (%) and 20 Pods length (cm) on Groundnut Varieties**

S. No.	Varieties	Sound Mature K. (SMK %)	20 pod length (cm)
1	Parachinar	84.9	69.4 A
2	ICGS-234	89.6	73.7 A
3	PI-429629	87.6	58.7 B
4	429411 (Check)	84.6	49.6 C
LSD value at (P≤ 0.05)		N.S.	7.7

**3. Plant Population and Pod Yield (per ha.)**

Data on plant population and pod yield is presented in table-3. Plant population remained non significant. Data on pod yield showed significant differences at 5% level of significance. It was observed that varieties ICGS-234 and Parachinar had maximum pod yield of 3958.6 kg ha<sup>-1</sup>, and 3796.6 kg ha<sup>-1</sup> respectively, while minimum pod yield of 2037.1 kg ha<sup>-1</sup> was recorded for check variety 429411. Variation in pod yield may largely due to earthing up operation. Those varieties in which earthing operation was performed had maximum pod yield as compared to check variety where no earthing up was done. The results are in agreement with Prasad and Muralidharudu (1991) who reported that the aerial pegs which otherwise go waste without developing into pods, may be converted into productive pods with good seed filling, by earthing up operation. However, this may also be attributed to specific genetic characteristics, soil fertility, soil structure and prevailing agro-climatic conditions. The results are also in agreement with Mkandawire and Sibuga 2002 and Ouedraogo et al. 2012.



**Table-3: Effects of Earthing up on Plant Population/ha and Pod Yield (kg ha-1) of Groundnut Varieties**

S. No.	Varieties	P.P/ha	Pod yield kg ha-1
1	Parachinar	63894	3796.6 A
2	ICGS-234	65283	3958.6 A
3	PI-429629	60653	2509.5 B
4	429411 (Check)	59727	2037.1 C
LSD value at (P≤ 0.05)		N.S.	394.6

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