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# Effect of land situations, various planting geometry and levels of fertilizer on yield attributes, yield and quality of finger millet (*Eleusine coracana* (L) Gaertn) grown under lateritic soil of Konkan region

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**Abstract**
The investigation "effect of land situations, various planting geometry and levels of fertilizer on yield attributes, yield and quality of finger millet (*Eleusine coracana* (L) Gaertn) grown under lateritic soil of *Konkan* region" was conducted at Agronomy Farm, College of Agriculture, Dapoli, Dist. Ratnagiri (M.S.) during *kharif* season of 2017 and 2018. The field experiment was laid out in a split-split plot design. Main plot treatment consisted of three land situations *viz*., upland situation ($LS_1$), midland situation ($LS_2$) and gently sloppy (*Varkas*) land ($LS_3$), the sub plot treatment consisted of five planting geometry *viz*.,15 cm x 10 cm ($PG_1$), 20 cm x 10 cm ($PG_2$), 25 cm x 10 cm ($PG_3$), 30 cm x 10 cm ($PG_4$) and 20 cm x 15 cm ($PG_5$),while, sub-sub plot treatment comprised of five fertilizer levels *viz*., 80: 40: 0 NPK kg $ha^{-1}$ (RDF) without FYM ($F_1$), 80: 40: 0 NPK kg $ha^{-1}$ (RDF) with FYM 5 t $ha^{-1}$ ($F_2$), 80: 40: 40 NPK kg $ha^{-1}$ with FYM 5 t $ha^{-1}$ ($F_3$), 100: 50: 50 NPK kg $ha^{-1}$ with FYM 5 t $ha^{-1}$ ($F_4$) and 120: 60: 60 NPK kg $ha^{-1}$ with FYM 5 t $ha^{-1}$ ($F_5$). Thus, there were 25 treatment combinations replicated three times. On the basis of investigation, it can be concluded that the finger millet crop should be grown during *kharif* season on upland situation (well drained) followed by gently sloppy land (*Varkas*) with 25 cm x 10 cm planting geometry along with application of fertilizer dose @ 100: 50: 50 NPK kg $ha^{-1}$ with FYM 5 t $ha^{-1}$ for obtaining maximum yield attributing characters, yield and quality under south *Konkan* condition.

**Keywords:** Finger millet, land situations, levels of fertilizer, planting geometry, quality, yield attributing characters and yield

## Introduction

Finger millet (*Eleusine coracana* G.) is staple food of tribles and lower income class. Finger millet has some unique qualities, which makes it potentially valuable product. It has low glycemic index. This makes it a boon for the people suffering from diabetes and obesity (Arora and Srivastava, 2002) [6]. It has excellent malting qualities with considerable industrial potential for producing malt extract and beverages. The grains are malted and fed to infants due to its high nutritious value and suggested as the best weaning food which is popularly known as '*Nachani Satva*'. It is usually converted into flour, which is used for preparation of cake / puddings / porridge.

Finger millet is an important food grain crop of semi-arid tropics particularly of India and East Africa and Srilanka. In India, finger millet is cultivated over wide range of agro-climatic conditions almost in all the states. Finger millet contributes nearly 40 per cent of small millets in India. Finger millet contributes an area of 1.27 million ha with average annual production 1.89 million tonnes with productivity 1490 kg $ha^{-1}$ (Anonymous 2011) [1]. In Maharashtra, finger millet occupies an area of about 166.8 thousand hectare ha with an annual grain production of 170.2 thousand tonnes. It is mainly cultivated in Thane, Raigad, Ratnagiri, Sindhudurg, Dhule, Jalgaon, Nashik, Ahmednagar, Pune, Satara and Kolhapur districts.

The largest acreage of *ragi* is in *Konkan* region. In *Konkan* region, finger millet plays an important role in agriculture with an area of 38488 hectares of Maharashtra comprising with an annual production 41136 tonnes. However, the productivity in Thane, Palghar, Raigad, Ratnagiri and Sindhudurg is very low 1167 kg $ha^{-1}$.

The productivity is low due to delay in nursery sowing and late transplanting, faulty methods of cultivation and little or no use of fertilizers. The secret of boosting its yields mainly lies in timely transplanting and properly fertilizing the crop. It is well known that there is direct positive correlation between fertilizer consumption and food grain production. Major finger millet growing areas in the region are highly eroded sandy clay loams. Poor fertility and low moisture holding capacity are the characteristics of these soils. Fertilizer use efficiency is low in the region due to heavy rainfall and it is revealed from the studies that integration of nutrient sources improves fertilizer use efficiency (Tondon, 1992) [25]. Hence, integrated nutrient management is one of the key components of intensive agriculture.

The finger millet crop has given secondary importance and generally the crop grown on hill slope and varkas land and hence the productivity of finger millet is low due to delay in nursery sowing and late transplanting, faulty methods of cultivation and little or no use of fertilizers. It is nutritionally high value crop and to maintain human health, the demand of nagli has been increased day by day and hence it is necessary to test land suitability for yield maximization of nagli. Finger millet is a premium crop as compared to other millets. Finger millet put forth luxuriant growth during *kharif* season, therefore to find out suitable land situation, planting geometry and optimum fertilizer dose for the maximization of yield. Keeping these points of views, it is proposed to conduct a field experiment on, "Effect of land situations, various planting geometry and levels of fertilizer on yield attributes, yield and quality of finger millet (*Eleusine coracana* (L) Gaertn) grown under lateritic soil of *Konkan* region" was conducted.

## Materials and Methods

The investigation "effect of land situations, various planting geometry and levels of fertilizer on yield attributes, yield and quality of finger millet (*Eleusine coracana* (L) Gaertn) grown under lateritic soil of *Konkan* region" was conducted at Agronomy Farm, College of Agriculture, Dapoli, Dist. Ratnagiri (M.S.) during *kharif* season of 2017 and 2018. The site was selected on the basis of suitability of soil for the cultivation of finger millet on various land situations. The topography of the experimental plot was fairly uniform leveled, water saturated and gently sloppy land (*Varkas*). The plot was well drained and provided drainage for removal excess rain water during both years of *kharif* season.

The field experiment was laid out in a split-split plot design. Main plot treatment consisted of three land situations *viz*., upland situation ($LS_1$), midland situation ($LS_2$) and gently sloppy (*Varkas*) land ($LS_3$), the sub plot treatment consisted of five planting geometry *viz*.,15 cm x 10 cm ($PG_1$), 20 cm x 10 cm ($PG_2$), 25 cm x 10 cm ($PG_3$), 30 cm x 10 cm ($PG_4$) and 20 cm x 15 cm ($PG_5$),while, sub-sub plot treatment comprised of five fertilizer levels *viz*., 80: 40: 0 NPK kg $ha^{-1}$ (RDF) without FYM ($F_1$), 80: 40: 0 NPK kg $ha^{-1}$ (RDF) with FYM 5 t $ha^{-1}$ ($F_2$), 80: 40: 40 NPK kg $ha^{-1}$ with FYM 5 t $ha^{-1}$ ($F_3$), 100: 50: 50 NPK kg $ha^{-1}$ with FYM 5 t $ha^{-1}$ ($F_4$) and 120: 60: 60 NPK kg $ha^{-1}$ with FYM 5 t $ha^{-1}$ ($F_5$). Thus, there were 25 treatment combinations replicated three times. The variety *Dapoli 2* (Somaclonal variation developed through tissue culture technique) of finger millet was used in the investigation. Seeds were treated with thiram @ 3 g $kg^{-1}$ of seed, before sowing in order to protect the crop against seed and soil borne fungal diseases.

The finger millet nursery was manured with FYM @ 100 kg $R^{-1}$ and it was mixed thoroughly into soil at the time of seedbed preparation. Then, nursery beds of 3 m x 1 m size were prepared in a well tilled plot. Fertilizers *viz*., urea @ 1 kg and single super phosphate @ 3 kg were applied for 100 sq. m. nursery area at the time of sowing of finger millet seed. The transplanting of the seedlings was done at different land situations. Application of full dose of FYM and basal dose of N, $P_2O_5$, $K_2O$ as per the treatments were done at the time of transplanting. The basal dose of N, $P_2O_5$, $K_2O$ included half dose of nitrogen and full dose of phosphorus and potassium. Remaining half dose of nitrogen (urea) was applied at 30 DAT. Seeds were treated with thiram @ 3 g $kg^{-1}$ of seeds, before sowing in order to protect the crop against seed and soil borne fungal diseases. Poison bait of phorate @ 10 kg $ha^{-1}$ was placed in crab holes in the field and on bund area of experimental plots to control crab attack. Spraying of trycyclozole 75 WP and propiconazole @ 0.05 per cent for control of foot rot and one spraying of carbendanzim @ 0.1 per cent for controlling of leaf spot disease.

All biometric and other observations recorded during the course of investigation. The data related to each character of the finger millet crop was analyzed statistically by using standard method of 'Analysis of variance' as applicable to split-split plot design by Gomez and Gomez (1983) and A text book of Agricultural statistics by Rangaswamy (2002).The significance of the treatment difference was tested by 'F' test (variance ratio). Further, the critical difference (C.D) at 5 per cent level of probability was worked out for comparison and statistical interpretation of significance among the treatment means.

## Results and Discussion

Data regarding yield attributing characters *viz*. length of earhead (cm), number of finger $earhead,^{-1}$ number of earhead $hill^{-1}$, weight of earhead $hill^{-1}$(g), grain and straw weight $hill^{-1}$ (g), thousand grain weight (g) and protein content as influenced by different treatments are presented in Table 1, 2 & 3.

### Effect of land situations

The data depicted in Table 1 revealed that, the different land situations were significantly influenced in relation to length of earhead during both the years. The upland situation ($LS_1$) recorded significantly more length of earhead (cm) over mid land situation and at par with gently sloppy land ($LS_3$) during both years of study.

The upland situation ($LS_1$) recorded significantly maximum number of finger $earhead^{-1}$ over midland situation and statistically identical with gently sloppy land ($LS_3$) during the year 2017 and 2018 i.e.6.81 and 8.60 respectively.

Among different land situations the upland situation ($LS_1$) recorded significantly more number of earhead $hill^{-1}$ over midland ($LS_2$) and at par with gently sloppy land situation ($LS_3$)

It was revealed from the data presented in Table 1 that during *kharif* 2017 and 2018 the upland situation ($LS_1$) recorded significantly higher weight of earhead than rest of land situations.

The scrutiny of data presented in Table 2 revealed that, the mean grain weight $hill^{-1}$ (g)was significantly influenced due to different land situations during both the years of experimentation. The upland situation ($LS_1$) recorded significantly higher grain weight over midland situation and at par with gently sloppy land ($LS_3$) during 2017.

The mean straw weight of finger millet $hill^{-1}$ (g) was differed statistically due to different land situations during both the years. The upland situation ($LS_1$) recorded significantly higher straw weight over remaining land situations during both the years. Similarly, the gently sloppy land ($LS_3$) significantly superior in producing straw weight over midland situation.

The beneficial effect of finger millet crop grown in upland situation ($LS_1$) followed by gently sloppy land ($LS_3$) in enhancing the growth through increased crop height, number of functional leaves, number of tillers, and dry matter production ultimately reflected in higher yield contributing characters *viz*., length of earhead, number of fingers earhead$^{-1}$, number of earhead hill$^{-1}$, weight of earhead hill$^{-1}$, grain and straw weight hill$^{-1}$ and thousand grain weight. The grain yield of finger millet was a function of all these yield attributes of an individual plant and ultimately grain yield obtained from the plant. The results are similar with the result reported by Bhatkar and lendve (1980) [7], Nayak, (1995) [20].

Significantly highest grain yield of 22.71, 29.77 and 26.24 q ha$^{-1}$ was recorded by upland situation ($LS_1$) followed by gently sloppy land ($LS_3$) grain yield of 19.72, 23.70 and 21.71 q ha$^{-1}$ during the years 2017, 2018 and in pooled analysis, respectively. Increase in grain yield over midland situation ($LS_2$) due to the treatments upland situation ($LS_1$) and followed by gently sloppy land ($LS_3$) in pooled analysis (Table 2) was to the tune of 74.05 and 68.63 per cent, respectively. Similar trend was also observed in straw yield (Table 2) during both the years of experimentation and in pooled analysis. The increase in yield might be due to result of optimum growth and development parameters associated with favourable weather condition responsible for more growth and development of crop. The increased yield attributes might be due to increased growth and development parameters which ultimately resulted in increased grain. These results reported by Bhatkar and lendve (1980) [7], Nayak (1995) [20].

In respect of quality parameters, protein content in grain and straw and their total uptake recorded statistically superior in upland situation ($LS_1$) over rest of land situation during both years of study. These results are similar with the finding reported by Bhatkar and lendve (1980) [7], Ghadage (1982) [15].

**Effect of various planting geometry**

The mean length of earhead (cm) was not influenced significantly due to various planting geometry during both the years.

The mean number of fingers earhead$^{-1}$ was significantly influenced due to various planting geometry during both the years of study. Whereas significantly higher number of fingers earhead$^{-1}$ was recorded in 25 cm x 10 cm ($PG_3$) planting geometry and on par with 30 cm x 10 cm ($PG_4$) and 20 cm x 15 cm ($PG_5$) planting geometry during both the years.

Among various planting geometry 25 cm x 10 cm ($PG_3$) planting geometry recorded significantly more number of earhead hill$^{-1}$ during *kharif* 2017 and on par with treatment 30 cm x 10 cm ($PG_4$) and 20 cm x 15 cm ($PG_5$) planting geometry.

The mean weight of earhead was significantly influenced due to various planting geometry during *kharif* 2018. The planting geometry 25 cm x 10 cm ($PG_3$) recorded significantly higher weight of earhead over rest of treatments and at par with 30 cm x 10 cm ($PG_4$) and 20 cm x 15 cm ($PG_5$) planting geometry during *kharif* 2018.

The mean grain weight hill$^{-1}$ (g) of finger millet as significantly influenced due to various planting geometry during both the years. The 25 cm x 10 cm ($PG_3$) planting geometry recorded significantly higher grain weight over rest of treatments and at par with 20 cm x 15 cm ($PG_5$) planting geometry in respect of grain weight during both the years.

The mean straw weight hill$^{-1}$ (g) as influenced significantly due to various planting geometry during both the year of study. The 25 cm x 10 cm ($PG_3$) planting geometry recorded significantly higher weight of straw over reaming treatments and on par with 30 cm x 10 cm ($PG_4$) and 20 cm x 10 cm ($PG_5$) planting geometry during *kharif* 2017.

Though, the growth and development parameters of the various planting geometry were higher in the second year and also yield contributing characters. This is because of more congenial environment during flowering and grain filling stage than first year. A high intensity of rainfall in the first year during flowering and grain filling stage. However, length of earhead, number of fingers earhead$^{-1}$, number of earhead hill$^{-1}$, weight of earhead hill$^{-1}$ and grain and straw weight hill$^{-1}$ were comparatively less various planting geometry during the first year. This is because of less filled grains and more unfilled grains are produced during the first year. Perusal of the data presented in Table 18, 19 and 22 revealed that, 25 cm x 10 cm ($PG_3$) planting geometry produced significantly the higher length of earhead, number of fingers earhead$^{-1}$, number of earhead hill$^{-1}$, weight of earhead hill$^{-1}$ and grain and straw weight hill$^{-1}$ over rest of planting geometry. The similar findings was reported by Roy *et al.* (2001) [23] and Anonymous 2016 [4].

It was revealed from the data presented in Table 2 that, the 25 cm x 10 cm ($PG_3$) planting geometry recorded significantly highest grain yield of 17.03, 23.57 and 20.30 q ha$^{-1}$ during the years 2017, 2018 and in pooled analysis, respectively and which was statistically identical with 20 cm x 15 cm during, 2017. The straw yield (Table 2) was also observed significantly highest with 25 cm x 10 cm ($PG_3$) planting geometry treatment of 34.77, 47.35 and 40.27 q ha$^{-1}$ during the years 2017, 2018 and in pooled analysis, respectively and which was statistically identical with 20 cm x 15 cm during, 2017. Dapoli 2 (*Somaclonal*) variety of finger millet plant allowed to transform more energy into the better production of yield attributes and proved advantageous in increasing the yield potential. The results are in confirmation with the results reported by Joshi *et al*. (1989) [18] and Roy *et al.* (2001) [23].

Variation on protein content and protein yield (Table 3) in finger millet grain and straw was significantly influenced due to different planting geometry during both the years. However, 25 cm x 10 cm ($PG_3$) planting geometry treatment recorded higher protein content (8.64 and 10.00%) in grain as well as in straw (5.30 and 3.86%) and total protein harvest (34,676.34 and 44,644.04 kg ha$^{-1}$) during the first and second year, respectively.

**Effect of different levels of fertilizer**

Among different fertilizer levels during both the years of investigation, the mean length of earhead was significantly was recorded maximum in 120: 60: 60 NPK kg ha$^{-1}$ with FYM ($F_5$) and remains on par with 100: 50: 50 NPK kg ha$^{-1}$ with FYM ($F_4$) during both the years and other fertilizer levels in that descending order of significance.

Among different fertilizer levels during both the years of investigation, the mean number of fingers earhead$^{-1}$ was found to be significant. Significantly maximum number of fingers earhead$^{-1}$ was recorded in 120: 60: 60 NPK kg ha$^{-1}$ with FYM ($F_5$) and at par with 100: 50: 50 NPK kg ha$^{-1}$ with FYM ($F_4$) and other fertilizer levels in that descending order of significance.

Among different fertilizer levels during both the years of investigation, the mean number of fingers earhead$^{-1}$ was significantly influenced. Significantly maximum number of earhead hill$^{-1}$ was recorded in 120: 60: 60 NPK kg ha$^{-1}$ with FYM ($F_5$) and at par with 100: 50: 50 NPK kg ha$^{-1}$ with FYM ($F_4$) and other fertilizer levels in that descending order of significance.

The data presented in Table 1 revealed that, the mean weight of earhead (g) hill$^{-1}$ of finger millet was significantly influenced due to different fertilizer levels during both the years of study. The fertilizer level 120: 60: 60 NPK kg ha$^{-1}$with FYM ($F_5$) recorded significantly higher weight of earhead (g) hill$^{-1}$ than rest of fertilizer levels and at par with100: 50: 50 NPK kg ha$^{-1}$with FYM ($F_4$) during *Kharif* 2017.

The values of mean grain weight of finger millet were significantly influenced due to different fertilizer levels during both the years of study. The fertilizer level 120: 60: 60 NPK kg ha$^{-1}$with FYM ($F_5$) recorded significantly higher grain weight than the rest of fertilizer levels and remain at par with 100: 50: 50 NPK kg ha$^{-1}$ with FYM ($F_4$) during both the years and other fertilizer levels in that descending order of significance.

The mean straw weight hill$^{-1}$ (g) of finger millet was significantly influenced due to various fertilizer levels under study. The application of 120: 60: 60 NPK kg ha$^{-1}$ with FYM ($F_5$) recorded significantly higher straw weight of finger millet over rest of treatments but it was at par with 100: 50: 50 NPK kg ha$^{-1}$ with FYM ($F_4$) during 2018.

The increase in yield attributes may be accounted due to principles and concept of phyllochronic utilization that follow by young seedling and thus improved the growth parameters *viz.*, Plant height, production of more number of functional leaves hill$^{-1}$ that are the major source of photosynthetic activity in finger millet with proper partitioning of assimilates into the leaves, stems and roots. The current results are similar with the finding of Sridhara *et al*. (2003) [24], Chavan *et al*. (2017a) [8], Chavan *et al*. (2018a) [10] and Chavan *et al*. (2018b) [11].

Perusal of the data presented in Table 1 revealed that, different fertilizer levels significantly influenced the values of mean grain yield of finger millet during individual years and in pooled analysis. Application of 120: 60: 60 NPK kg ha$^{-1}$ with FYM ($F_5$) recorded significantly higher grain yield (q ha$^{-1}$) over rest of the treatments in *kharif* 2017 & 2018 and in pooled analysis and statistically identical with 100: 50: 50 NPK kg ha$^{-1}$ with FYM ($F_4$) during individual years. The increased yield over the treatment 80: 40: 00 NPK kg ha$^{-1}$ (RDF) without FYM ($F_1$) in pooled analysis due to various fertilizers levels viz. $F_2$, $F_3$, $F_4$ and $F_5$ was to the tune of 15.30, 31.03, 52.95 and 56.32 per cent, respectively. The mean straw yield (q ha$^{-1}$) differed significantly due to various fertilizer levels during individual years and in pooled analysis. The fertilizer level 120: 60: 60 NPK kg ha$^{-1}$ with FYM ($F_5$) produced significantly higher straw yield (37.18, 46.34 and 41.76 q ha$^{-1}$, respectively) during 2017, 2018 and in pooled analysis over rest of treatments and at par with 100: 50: 50 NPK kg ha$^{-1}$ with FYM ($F_4$) fertilizer level during 2017 and remaining fertilizer levels in that descending order of significance.

The increment in yield of finger millet was mainly be due to higher photosynthetic and metabolic efficiency for assimilation of energy and their partitioning into the yield attributing characters *viz.,* length of earhead, number of fingers earhead$^{-1}$, number of earhead hill$^{-1}$, weight of earhead hill$^{-1}$ and grain and straw weight hill$^{-1}$ and yield produced significantly more during the second and first year, respectively (Table 2). The increment in dry matter accumulation hill$^{-1}$ might be due to the production of higher number of source (green leaves) with expanding leaf-area that harvest more solar radiation helpful to catalyses the synthesis of good amount photosynthates and ultimately produced higher yield. Similar findings were reported by Ahiwale *et al*. (2011) [3], Ahiwale *et al*. (2013) [2], Gawade *et al*. (2013) [14] and Nevase *et al*. (2013) [22].

The higher protein content in grain (10.37% and 10.67%), straw (5.89% and 4.73%) and total protein harvest (41,567.44 and 48,981.45 kg ha$^{-1}$) were recorded by application of 120: 60: 60 NPK kg ha$^{-1}$ with FYM ($F_5$) during the first and second year, respectively (Table 3). This might be due to higher affectivity for nitrate reduction activities in source and catalysis enzyme that are associates with synthesis of amino acid, a precursor for building block of protein in grains. These results were supported by Chellumathu *et al*. (1988) [13], Navalagi *et al*. (2011) [21], Goud (2012) [17], Chavan *et al*. (2017b) [9] and Chavan *et al*. (2019) [12].

**Interaction effects between the land situation, various planting geometry and different levels of fertilizer**

Interaction effect between land situations & planting geometry and land situations & fertilizer levels and land situations, planting geometry & fertilizer levels was found to be non significant in terms of length of earhead, number of fingers earhead$^{-1}$, number of earhead hill$^{-1}$ protein uptake in grain, straw and their total uptake by finger millet during both the years.

The data presented in Table 4 illustrated that, the interaction effect between land situations & planting geometry, land situations & fertilizer levels, planting geometry & fertilizer levels and land situations, planting geometry & fertilizer levels were found to be significant in respect of weight of earhead of finger millet during the year 2017 and 2018.

The data presented in Table 5 revealed that, the interaction effect between land situations and planting geometry as influenced by grain weight and straw weight was found to be significant during both the years.

**a) Land situation X planting geometry (LS X PG)**

The upland situation ($LS_1$) with 25 cm x 10 cm ($PG_3$) planting geometry recorded significantly higher grain weight over rest of treatment combinations and at par with $LS_1$ $PG_2$, $LS_1$ $PG_5$, $LS_3$ $PG_3$, $LS_3$ $PG_4$ and $LS_3$ $PG_5$ during 2017 and $LS_1$ $PG_5$ and $LS_3$ $PG_3$ during the year 2018.

The upland situation ($LS_1$) with 25 cm x 10 cm ($PG_3$) planting geometry recorded significantly higher straw weight over rest of treatment combinations during both the years of experimentation except $LS_1$ $PG_4$, $LS_1$ $PG_5$ and $LS_3$ $PG_3$, $LS_3$ $PG_4$ combinations during *kharif* 2017 and $LS_1$ $PG_5$ during *kharif* 2018. These results were supported by Modak (1979) [19].

The interaction effect between land situation and planting geometry revealed that, the upland situations ($LS_1$) with 25 cm x 10 cm ($PG_3$) planting geometry recorded significantly highest grain yield (q ha$^{-1}$) over rest of treatment combinations and remains at par with each other of treatment combinations $LS_1$ $PG_5$ and $LS_1$ $PG_1$, $LS_1$ $PG_2$, $LS_1$ $PG_4$ and $LS_1$ $PG_5$ during individual years i.e. 2017, 2018 and $LS_1$ $PG_5$ in pooled analysis. These results were supported by Modak (1979) [19].

The interaction effect between land situation and planting geometry on straw yield (q $ha^{-1}$) differed significantly during both the years and in pooled analysis. The upland situations ($LS_1$) with 25 cm x 10 cm ($PG_3$) planting geometry recorded significantly highest straw yield (q $ha^{-1}$) over rest of treatment combinations during both the years and in pooled analysis. These results were supported by Modak (1979) [19].

The interaction effect between land situation and planting geometry on biological yield of finger millet differed significantly during both the years. The Upland situation ($LS_1$) with 25 cm x 10 cm ($PG_3$) planting geometry recorded significantly higher biological yield (q $ha^{-1}$) over rest of the treatment combinations during both the years.

**b) Land situation X different levels of fertilizer (LS X F)**

The interaction effect between land situation and fertilizer levels on weight of earhead $hill^{-1}$ (g), the upland situation ($LS_1$) along with application of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher over rest of treatment combinations and on par with 100: 50: 50 NPK kg $ha^{-1}$ with FYM ($F_4$) i.e. $LS_1$ $F_4$ during both the years of investigation.

The interaction effect between land situation and fertilizer levels on straw weight differed significantly during both the years. The upland situation ($LS_1$) with application of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher straw weight over rest of treatment combinations and at par with each other $LS_1$ $PG_4$ and $LS_3$ $PG_4$ during both the years. These results were supported by Joshi *et al*. (1989) [18] and Anonymous (2007) [5].

The interaction effect between land situation and fertilizer levels on grain yield (q $ha^{-1}$) differed significantly during both the years. The upland situation ($LS_1$) with application of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly highest grain yield (q $ha^{-1}$) over remaining treatment combinations during both the years and in pooled analysis and remains at par with $LS_1F_4$ treatment combination during *kharif* 2017, *kharif* 2018 and in pooled analysis.

The interaction effect between land situation and fertilizer levels on straw yield (q $ha^{-1}$) differed significantly during both the years and in pooled analysis. The upland situation ($LS_1$) with application of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly highest straw yield (q $ha^{-1}$) over remaining treatment combinations during both the years and in pooled analysis and remains at par with $LS_1F_4$ treatment combination during *kharif* 2018 and in pooled analysis. These results were supported by Joshi *et al*. (1989) [18] and Anonymous (2007) [5].

The interaction effect between land situation and fertilizer levels on biological yield of finger millet differed significantly during both the years. The upland situation ($LS_1$) with application of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher biological yield over remaining treatment combinations and at par with $LS_1F_4$ during *kharif* 2017 and *kharif* 2018.

**c) Planting geometry X different levels of fertilizer (PG X F)**

With respect to weight of earhead the interaction effect between planting geometry and fertilizer levels, 25 cm x 10 cm ($PG_3$) planting geometry along with application of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher (8.71 $hill^{-1}$) g over rest of treatment combinations during both the years and at par with $PG_2$ $F_4$, $PG_2$ $F_5$, $PG_3$ $F_3$, $PG_3$ $F_4$,, $PG_4$ $F_3$, $PG_4$ $F_4$, $PG_4$ $F_5$ and $PG_5$ $F_4$, $PG_5$ $F_5$ during 2017 and $PG_4$ $F_4$, & $PG_5$ $F_4$ treatment combinations during 2018.

The interaction effect between planting geometry and fertilizer levels statistically differed during both the years. The planting geometry 25 cm x 10 cm ($PG_3$) and fertilizer level 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher weight of grains over rest of treatment combinations and which was at par with the combinations of $PG_3$ $F_4$, $PG_5$ $F_4$ and $PG_5$ $F_5$ during *kharif* 2017 and $PG_5F_4$ during *kharif* 2018.

Interaction effect between planting geometry and fertilizer levels on straw weight differed significantly during *kharif* 2017. The 25 cm x 10 cm ($PG_3$) planting geometry with the supply of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher straw weight over rest of treatment combinations except $PG_3$ $F_4$, $PG_4$ $F_4$, $PG_4$ $F_5$ and $PG_5$ $F_4$, $PG_5$ $F_5$ treatment combinations.

Interaction effect between planting geometry and fertilizer levels on grain yield (q $ha^{-1}$) differed significantly during 2018 and in pooled analysis. The 25 cm x 10 cm ($PG_3$) planting geometry along with application of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher grain yield (q $ha^{-1}$) of finger millet over rest of treatment combinations during individual years and in pooled analysis and remains at par with $PG_3$ $F_4$ during 2018 and $PG_3F_4$ and $PG_5F_5$ in pooled analysis. These results were supported by Anonymous, (2007) [5].

Interaction effect between planting geometry and fertilizer levels on straw yield (q $ha^{-1}$) differed significantly during both the years and in pooled analysis. The 25 cm x 10 cm ($PG_3$ planting geometry) along with application of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher straw yield (q $ha^{-1}$) of finger millet over rest of the treatment combinations during individual years and in pooled analysis and remains at par with $PG_3$ $F_4$, $PG_5$ $F_4$, $PG_4$ $F_5$ and $PG_5F_5$, during 2017 and $PG_3F_4$ during *kharif* 2018 and in pooled analysis.

Interaction effect between planting geometry and fertilizer levels on biological yield (q $ha^{-1}$) differed significantly during both the years. The 25 cm x 10 cm ($PG_3$) planting geometry along with application of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher biological yield of finger millet over rest of the treatment combinations and at par with $PG_3$ $F_4$, $PG_5$ $F_4$ and $PG_5$ $F_5$ during 2017 and $PG_3$ $F_4$ during 2018. These results were supported by Roy, *et al*. (2001) [23].

**d) Land situation X various planting geometry X different levels of fertilizer (LS X PG X F)**

The interaction effect between land situations, planting geometry and fertilizer levels were found to be significant during both the years. The upland situation ($LS_1$) with 25 cm x 10 cm ($PG_3$) planting geometry and supplied with 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) i.e. $LS_3$ $PG_3$ $F_5$ recorded significantly higher weight of earhead over rest of treatment combinations and was on par with $LS_3$ $PG_5$ $F_4$ treatment combination during 2018.

The interaction effect between land situations, planting geometry and fertilizer levels were found to be significant during both the years. The upland situation ($LS_1$) with 25 cm x 10 cm ($PG_3$) planting geometry and supplied of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher weight of grain over rest of treatment combinations and which was on par with $LS_1$ $PG_3$ $F_4$, $LS_3$ $PG_3$ $F_4$ treatment combinations during 2017 and $LS_3$ $PG_3$ $F_4$ treatment combination during 2018.

Interaction effect between land situations, planting geometry and fertilizer levels on straw weight statistically differed during both the years. The upland situation ($LS_1$) with planting geometry 25 cm x 10 cm ($PG_3$) and supplied of 100: 50: 50 NPK kg $ha^{-1}$ with FYM ($F_4$) recorded significantly higher straw weight over rest of treatment combinations and which was on par with $LS_1$ $PG_3$ $F_5$ during 2017 and $LS_1$ $PG_3$ $F_5$, $LS_1$ $PG_5$ $F_4$ and $LS_1$ $PG_5$ $F_5$ treatment combinations during 2018.

Interaction effect between land situations, planting geometry and fertilizer levels on grain yield (q $ha^{-1}$) statistically differed during both the years. The upland situation ($LS_1$) with planting geometry 25 cm x 10 cm ($PG_3$) and supplied of 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher grain yield (q $ha^{-1}$) over rest of treatment combinations and which remains at par with $LS_1$ $PG_5$ $F_4$ during 2017, & $LS_1$ $PG_1$ $F_5$, $LS_1$ $PG_2$ $F_4$, $LS_1$ $PG_2$ $F_5$, $LS_1$ $PG_3$ $F_4$, $LS_1$ $PG_4$ $F_4$, $LS_1$ $PG_4$ $F_5$ and $LS_1$ $PG_5$ $F_5$ during 2018 and $LS_1$ $PG_3$ $F_4$ and $LS_1$ $PG_5$ $F_5$ in pooled analysis.

Interaction effect between land situations, planting geometry and fertilizer levels on straw yield (q $ha^{-1}$) statistically differed during both the years and in pooled analysis. The upland situation ($LS_1$) with 25 cm x 10 cm ($PG_3$) planting geometry and along with 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly superior in producing straw yield (q $ha^{-1}$) over rest of treatment combinations and which was at par with $LS_1$ $PG_3$ $F_4$ during 2018 and in pooled analysis. These results were supported by Joshi. *et al*. (1989) [18] and Anonymous, (2007) [5].

Interaction effect between land situations, planting geometry and fertilizer levels on biological yield of finger millet statistically differed during both the years. The upland situation ($LS_1$) with 25 cm x 10 cm ($PG_3$) planting geometry and supplied with 120: 60: 60 NPK kg $ha^{-1}$ with FYM ($F_5$) recorded significantly higher biological yield of finger millet over rest of the treatment combinations during both the years and remains at par with $LS_1$ $PG_3$ $F_4$ treatment combination during 2018.

**Table 1:** Length of earhead, number of fingers earhead$^{-1}$, number of earhead hill$^{-1}$, Weight of earhead hill$^{-1}$ (g) of finger millet as influenced by different treatments during *kharif* 2017 and 2018

| Treatments | Length of earhead (cm) | | Number of fingers earhead$^{-1}$ | | Number of earhead hill$^{-1}$ | | Weight of earhead hill$^{-1}$ (g) | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2017 | 2018 | 2017 | 2018 | 2017 | 2018 |
| **A) Main plot:** Land situations (LS) | | | | | | | | |
| $LS_1$: Upland | 9.87 | 11.45 | 6.81 | 8.60 | 2.90 | 2.93 | 8.97 | 13.59 |
| $LS_2$: Mid land | 7.50 | 7.87 | 4.58 | 4.86 | 1.09 | 1.95 | 3.24 | 3.33 |
| $LS_3$: Gently sloppy land | 9.73 | 10.07 | 6.53 | 8.15 | 2.58 | 2.62 | 7.12 | 10.81 |
| S.Em. ± | 0.33 | 0.29 | 0.18 | 0.13 | 0.05 | 0.21 | 0.17 | 0.18 |
| C.D. at 5% | 1.28 | 1.15 | 0.71 | 0.51 | 0.21 | N.S. | 0.65 | 0.71 |
| **B) Sub plot :** Planting geometry (PG) | | | | | | | | |
| $PG_1$: 15 cm x 10 cm | 8.83 | 9.45 | 5.64 | 6.87 | 1.68 | 2.05 | 5.42 | 7.52 |
| $PG_2$: 20 cm x 10 cm | 8.94 | 9.79 | 5.89 | 7.01 | 2.16 | 2.28 | 6.00 | 7.91 |
| $PG_3$: 25 cm x 10 cm | 9.39 | 9.98 | 6.26 | 7.44 | 2.50 | 2.90 | 7.22 | 10.70 |
| $PG_4$: 30 cm x 10 cm | 8.99 | 9.82 | 6.00 | 7.33 | 2.28 | 2.52 | 6.82 | 9.92 |
| $PG_5$: 20 cm x 15 cm | 9.01 | 9.94 | 6.08 | 7.38 | 2.32 | 2.75 | 6.94 | 10.15 |
| S.Em. ± | 0.18 | 0.15 | 0.13 | 0.14 | 0.09 | 0.22 | 0.57 | 0.28 |
| C.D. at 5% | N.S. | N.S. | 0.37 | 0.41 | 0.27 | N.S. | N.S. | 0.81 |
| **C) Sub-sub plot :** Fertilizers levels (F) | | | | | | | | |
| $F_1$: 80: 40: 00 NPK kg $ha^{-1}$ (RDF) without FYM | 8.10 | 9.05 | 5.21 | 6.20 | 1.53 | 1.83 | 4.94 | 7.17 |
| $F_2$: 80: 40: 00 NPK kg $ha^{-1}$ (RDF) with FYM | 8.63 | 9.45 | 5.58 | 6.78 | 1.86 | 2.11 | 5.63 | 8.15 |
| $F_3$: 80: 40: 40 NPK kg $ha^{-1}$ with FYM | 8.90 | 9.87 | 5.92 | 7.27 | 2.24 | 2.34 | 6.46 | 9.18 |
| $F_4$:100: 50: 50 NPK kg $ha^{-1}$ with FYM | 9.76 | 10.30 | 6.51 | 7.87 | 2.60 | 2.96 | 7.54 | 10.65 |
| $F_5$:120: 60: 60 NPK kg $ha^{-1}$ with FYM | 9.77 | 10.31 | 6.65 | 7.91 | 2.71 | 3.25 | 7.82 | 11.06 |
| S.Em. ± | 0.08 | 0.05 | 0.06 | 0.06 | 0.05 | 0.22 | 0.14 | 0.14 |
| C.D. at 5% | 0.21 | 0.15 | 0.17 | 0.17 | 0.14 | 0.62 | 0.39 | 0.39 |
| **Interaction effect** | | | | | | | | |
| LS x PG | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | Sig. | Sig. |
| LS x F | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | Sig. | Sig. |
| PG x F | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | Sig. | Sig. |
| LS x PG x F | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | Sig. | Sig. |
| General mean | 9.03 | 9.80 | 5.97 | 7.21 | 2.19 | 2.5 | 6.48 | 9.24 |

**Table 2:** Grain weight hill$^{-1}$ (g), Straw weight hill$^{-1}$ (g), Thousand grain weight, grain and straw yield (q $ha^{-1}$) of finger millet as influenced by different treatments during *kharif* 2017 & 2018

| Treatments | Grain weight hill$^{-1}$ (g) | | Straw weight hill$^{-1}$ (g) | | Thousand grain weight (g) | | Grain yield (q $ha^{-1}$) | | | Straw yield (q $ha^{-1}$) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2017 | 2018 | 2017 | 2018 | 2017 | 2018 | Pooled mean | 2017 | 2018 | Pooled mean |
| **A) Main plot:** Land situations (LS) | | | | | | | | | | | | |
| $LS_1$:Upland | 5.50 | 7.57 | 13.22 | 17.61 | 2.73 | 2.74 | 22.71 | 29.77 | 26.24 | 50.78 | 63.62 | 57.20 |
| $LS_2$:Mid land | 1.53 | 2.19 | 4.41 | 6.24 | 2.39 | 2.44 | 4.30 | 9.32 | 6.81 | 11.07 | 19.48 | 15.27 |
| $LS_3$:Gently sloppy land | 5.06 | 6.06 | 10.36 | 12.95 | 2.60 | 2.53 | 19.72 | 23.70 | 21.71 | 32.46 | 37.84 | 35.15 |
| S.Em. ± | 0.27 | 0.22 | 0.45 | 0.62 | 0.03 | 0.03 | 0.56 | 0.45 | 0.33 | 0.40 | 0.41 | 0.29 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C.D. at 5% | 1.07 | 0.88 | 1.78 | 2.45 | 0.13 | 0.13 | 2.19 | 1.77 | 1.29 | 1.55 | 1.61 | 0.93 |
| **B) Sub plot :** Planting geometry (PG) | | | | | | | | | | | | |
| $PG_1$:15 cm x 10 cm | 2.81 | 3.68 | 6.59 | 9.65 | 2.56 | 2.54 | 13.02 | 18.64 | 16.70 | 27.75 | 37.63 | 33.07 |
| $PG_2$: 20 cm x 10 cm | 3.61 | 3.89 | 7.85 | 11.13 | 2.57 | 2.55 | 14.62 | 19.40 | 17.01 | 29.14 | 38.26 | 33.38 |
| $PG_3$: 25 cm x 10 cm | 4.79 | 6.78 | 10.91 | 14.79 | 2.58 | 2.61 | 17.03 | 23.57 | 20.30 | 34.77 | 47.35 | 40.27 |
| $PG_4$: 30 cm x 10 cm | 4.15 | 5.60 | 10.50 | 12.51 | 2.58 | 2.57 | 14.81 | 21.32 | 18.06 | 32.33 | 38.38 | 36.13 |
| $PG_5$:20 cm x 15 cm | 4.78 | 6.40 | 10.80 | 13.27 | 2.58 | 2.60 | 16.67 | 21.72 | 19.19 | 33.19 | 39.93 | 36.52 |
| S.Em. ± | 0.21 | 0.16 | 0.53 | 0.30 | 0.01 | 0.02 | 0.54 | 0.33 | 0.35 | 0.59 | 0.34 | 0.34 |
| C.D. at 5% | 0.62 | 0.46 | 1.55 | 0.88 | N.S. | N.S. | 1.58 | 0.96 | 1.01 | 1.73 | 0.99 | 0.97 |
| **C) Sub-sub plot :** Fertilizers levels (F) | | | | | | | | | | | | |
| $F_1$: 80: 40: 00 NPK kg $ha^{-1}$ (RDF) without FYM | 3.00 | 4.03 | 7.35 | 9.82 | 2.39 | 2.41 | 11.55 | 16.30 | 13.92 | 24.45 | 33.29 | 28.87 |
| $F_2$: 80: 40: 00 NPK kg $ha^{-1}$ (RDF) with FYM | 3.48 | 4.62 | 8.26 | 10.91 | 2.50 | 2.50 | 13.75 | 18.35 | 16.05 | 27.36 | 36.55 | 31.96 |
| $F_3$: 80 : 40 : 40 NPK kg $ha^{-1}$ with FYM | 3.97 | 5.09 | 9.24 | 12.04 | 2.60 | 2.58 | 15.54 | 20.95 | 18.24 | 31.50 | 39.70 | 35.60 |
| $F_4$:100: 50: 50 NPK kg $ha^{-1}$ with FYM | 4.78 | 6.30 | 10.66 | 14.10 | 2.68 | 2.68 | 18.25 | 24.33 | 21.29 | 36.69 | 45.68 | 41.19 |
| $F_5$:120: 60: 60 NPK kg $ha^{-1}$ with FYM | 4.90 | 6.31 | 11.15 | 14.48 | 2.71 | 2.69 | 18.82 | 24.71 | 21.76 | 37.18 | 46.34 | 41.76 |
| S.Em. ± | 0.08 | 0.07 | 0.16 | 0.15 | 0.01 | 0.01 | 0.21 | 0.20 | 0.14 | 0.20 | 0.16 | 0.13 |
| C.D. at 5% | 0.23 | 0.21 | 0.44 | 0.43 | 0.03 | 0.03 | 0.59 | 0.55 | 0.40 | 0.55 | 0.46 | 0.36 |
| **Interaction effect** | | | | | | | | | | | | |
| LS x PG | Sig. | Sig. | Sig. | Sig. | N.S. | N.S. | Sig. | Sig. | Sig. | Sig. | Sig. | Sig. |
| LS x F | Sig. | Sig. | Sig. | Sig. | N.S. | N.S. | Sig. | Sig. | Sig. | Sig. | Sig. | Sig. |
| PG x F | Sig. | Sig. | Sig. | N.S. | N.S. | N.S. | Sig. | Sig. | Sig. | Sig. | Sig. | Sig. |
| LS x PG x F | Sig. | Sig. | Sig. | Sig. | N.S. | N.S. | Sig. | Sig. | Sig. | Sig. | Sig. | Sig. |
| General mean | 4.03 | 5.27 | 9.33 | 12.27 | 2.57 | 2.57 | 15.58 | 20.93 | 18.25 | 31.44 | 40.31 | 35.87 |

**Table 3:** Protein content, protein yield in grain & straw and total protein yield in finger millet as influenced by different treatments during *kharif* 2017 and 2018

| **Treatments** | **Protein content in grain (%)** | | **Protein content in straw (%)** | | **Protein yield in grain (kg $ha^{-1}$)** | | **Protein yield in straw (kg $ha^{-1}$)** | | **Total protein yield (kg $ha^{-1}$)** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **2017** | **2018** | **2017** | **2018** | **2017** | **2018** | **2017** | **2018** | **2017** | **2018** |
| **A) Main plot:** Land situations (LS) | | | | | | | | | | |
| $LS_1$: Upland | 7.79 | 7.96 | 5.33 | 3.99 | 18486.85 | 24607.31 | 27990.70 | 25748.74 | 46477.55 | 50356.06 |
| $LS_2$: Mid land | 7.62 | 7.48 | 3.93 | 3.31 | 3675.69 | 7872.52 | 4573.13 | 6739.74 | 8248.82 | 14612.26 |
| $LS_3$: Gently sloppy land (Varkas) | 7.61 | 7.60 | 4.30 | 3.80 | 15118.01 | 18821.58 | 14641.26 | 14777.52 | 29759.27 | 33599.11 |
| S.Em. ± | 0.06 | 0.09 | 0.03 | 0.02 | 598.57 | 484.20 | 140.32 | 295.08 | 667.48 | 702.78 |
| C.D. at 5% | N.S. | 0.37 | 0.12 | 0.07 | 2350.28 | 1901.22 | 550.97 | 1158.64 | 2620.85 | 2759.44 |
| | | | | | | | | | | |
| $PG_1$: 15 cm x 10 cm | 6.68 | 6.13 | 3.80 | 3.57 | 10790.58 | 13170.65 | 10950.14 | 13664.34 | 21740.72 | 26834.99 |
| $PG_2$: 20 cm x 10 cm | 7.32 | 6.50 | 4.15 | 3.63 | 11691.11 | 12689.45 | 14140.77 | 14594.21 | 25831.89 | 27283.66 |
| $PG_3$: 25 cm x 10 cm | 8.64 | 10.00 | 5.30 | 3.86 | 14559.84 | 25337.99 | 20116.51 | 19306.05 | 34676.34 | 44644.04 |
| $PG_4$: 30 cm x 10 cm | 7.55 | 7.47 | 4.32 | 3.72 | 10271.94 | 17704.59 | 14093.04 | 15080.89 | 24364.98 | 32785.48 |
| $PG_5$: 20 cm x 15 cm | 8.18 | 8.29 | 5.03 | 3.73 | 14820.77 | 16599.68 | 19374.70 | 16131.18 | 34195.47 | 32730.86 |
| S.Em. ± | 0.08 | 0.10 | 0.03 | 0.02 | 459.40 | 310.67 | 344.83 | 171.93 | 610.64 | 378.44 |
| C.D. at 5% | 0.24 | 0.30 | 0.08 | 0.06 | 1340.90 | 906.77 | 1006.49 | 501.83 | 1782.33 | 1104.60 |
| | | | | | | | | | | |
| $F_1$: 80: 40 : 00 NPK kg $ha^{-1}$ (RDF) without FYM | 5.09 | 4.72 | 2.98 | 2.55 | 6121.00 | 7876.31 | 8074.75 | 8984.92 | 14195.74 | 16861.22 |
| $F_2$: 80: 40: 00 NPK kg $ha^{-1}$ (RDF) with FYM | 6.66 | 6.00 | 3.85 | 3.25 | 9672.20 | 11294.94 | 11317.09 | 12394.75 | 20989.29 | 23689.69 |
| $F_3$: 80: 40: 40 NPK kg $ha^{-1}$ with FYM | 7.49 | 7.49 | 4.51 | 3.72 | 11824.84 | 15674.66 | 15280.00 | 15311.51 | 27104.84 | 30986.17 |
| $F_4$: 100: 50: 50 NPK kg $ha^{-1}$ with FYM | 8.76 | 9.51 | 5.37 | 4.25 | 16281.16 | 23801.86 | 20670.93 | 19958.35 | 36952.09 | 43760.20 |
| $F_5$: 120: 60: 60 NPK kg $ha^{-1}$ with FYM | 10.37 | 10.67 | 5.89 | 4.73 | 18235.05 | 26854.59 | 23332.39 | 22127.15 | 41567.44 | 48981.75 |
| S.Em. ± | 0.05 | 0.07 | 0.03 | 0.02 | 194.85 | 263.98 | 136.82 | 94.98 | 237.97 | 299.36 |
| C.D. at 5% | 0.14 | 0.19 | 0.08 | 0.05 | 545.59 | 739.16 | 383.11 | 265.94 | 666.32 | 838.21 |
| **Interaction effect** | | | | | | | | | | |
| LS x PG | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. |
| LS x F | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. |
| PG x F | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. |
| LS x PG x F | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. |
| General mean | 7.68 | 7.68 | 4.52 | 3.70 | 12426.85 | 17100.47 | 15735.03 | 17755.33 | 28161.88 | 32855.81 |

**Table 4:** Interaction effect of land situations & planting geometry, land situations & fertilizer levels, planting geometry & fertilizer levels and land situations, planting geometry and fertilizer levels on weight of earhead during *kharif* 2017 and 2018

| Treatments | Weight of earhead hill$^{-1}$ (g) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2017 | | | | | 2018 | | | | |
| **LS X PG** | **PG1** | **PG2** | **PG3** | **PG4** | **PG5** | **PG1** | **PG2** | **PG3** | **PG4** | **PG5** |
| LS1 | 7.17 | 8.73 | 10.30 | 8.71 | 9.95 | 11.07 | 11.45 | 16.12 | 13.84 | 15.45 |
| LS2 | 3.01 | 3.07 | 3.57 | 2.99 | 3.57 | 2.55 | 2.84 | 4.07 | 3.41 | 3.77 |
| LS3 | 6.02 | 6.24 | 8.72 | 6.58 | 8.54 | 7.71 | 9.73 | 13.15 | 11.59 | 11.86 |
| | S.E.± | 0.99 | C.D. at 5% | | 2.89 | S.E.± | 0.48 | C.D. at 5% | | 1.40 |
| LS x F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| LS1 | 7.30 | 7.95 | 9.04 | 10.23 | 10.34 | 10.90 | 12.09 | 13.25 | 15.51 | 16.19 |
| LS2 | 2.62 | 2.84 | 3.12 | 3.79 | 3.85 | 2.73 | 3.03 | 3.30 | 3.65 | 3.94 |
| LS3 | 4.89 | 6.11 | 7.21 | 8.55 | 9.33 | 7.88 | 9.34 | 10.99 | 12.79 | 13.05 |
| | S.E.± | 0.27 | C.D. at 5% | | 0.87 | S.E.± | 0.28 | C.D. at 5% | | 0.92 |
| PG X F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| PG1 | 4.12 | 5.11 | 5.36 | 6.04 | 6.47 | 5.78 | 6.51 | 7.09 | 9.01 | 9.20 |
| PG2 | 4.73 | 5.27 | 5.77 | 7.02 | 7.19 | 6.02 | 6.61 | 7.49 | 9.09 | 10.33 |
| PG3 | 5.00 | 5.94 | 7.47 | 8.41 | 8.71 | 9.09 | 10.02 | 11.28 | 10.16 | 12.98 |
| PG4 | 5.36 | 6.02 | 6.87 | 7.61 | 7.94 | 7.32 | 8.90 | 9.63 | 12.77 | 10.99 |
| PG5 | 5.48 | 5.81 | 6.83 | 8.63 | 8.23 | 7.63 | 8.71 | 10.40 | 12.22 | 11.80 |
| | S.E.± | 0.64 | C.D. at 5% | | 1.84 | S.E.± | 0.39 | C.D. at 5% | | 1.12 |
| LS X PG X F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| LS1 PG1 | 5.83 | 6.87 | 7.13 | 7.70 | 8.33 | 9.43 | 9.53 | 10.40 | 12.67 | 13.33 |
| LS1 PG2 | 7.57 | 7.77 | 8.93 | 9.80 | 9.60 | 8.80 | 9.97 | 10.70 | 13.27 | 14.50 |
| LS1 PG3 | 7.57 | 8.27 | 10.07 | 11.53 | 12.30 | 13.27 | 14.33 | 16.53 | 17.07 | 19.40 |
| LS1 PG4 | 8.20 | 9.47 | 10.50 | 11.27 | 9.40 | 10.27 | 12.80 | 13.40 | 16.33 | 16.40 |
| LS1 PG5 | 7.33 | 7.37 | 8.57 | 10.87 | 12.07 | 12.73 | 13.80 | 15.20 | 18.20 | 17.33 |
| LS2 PG1 | 2.53 | 2.87 | 3.13 | 3.30 | 3.50 | 3.33 | 3.47 | 3.50 | 4.13 | 4.40 |
| LS2 PG2 | 2.17 | 2.50 | 2.67 | 3.70 | 4.03 | 2.57 | 2.60 | 2.77 | 1.93 | 2.90 |
| LS2 PG3 | 2.53 | 2.63 | 3.00 | 3.50 | 3.27 | 1.93 | 2.53 | 3.13 | 3.40 | 5.77 |
| LS2 PG4 | 2.87 | 3.13 | 3.53 | 4.17 | 3.97 | 3.00 | 3.00 | 3.27 | 3.70 | 3.60 |
| LS2 PG5 | 3.00 | 3.07 | 3.27 | 4.57 | 4.17 | 2.80 | 3.27 | 3.40 | 4.20 | 4.60 |
| LS3 PG1 | 4.00 | 5.60 | 5.80 | 7.13 | 7.57 | 4.57 | 6.53 | 7.37 | 10.23 | 9.87 |
| LS3 PG2 | 4.47 | 5.53 | 5.70 | 7.57 | 7.93 | 6.70 | 7.27 | 9.00 | 12.07 | 13.60 |
| LS3 PG3 | 4.90 | 6.93 | 9.33 | 10.20 | 10.57 | 12.07 | 13.20 | 14.17 | 10.40 | 16.20 |
| LS3 PG4 | 5.00 | 5.47 | 6.57 | 7.40 | 10.47 | 8.70 | 10.63 | 11.80 | 11.97 | 13.87 |
| LS3 PG5 | 6.10 | 7.00 | 8.67 | 8.47 | 10.47 | 7.37 | 9.07 | 12.60 | 15.07 | 15.93 |
| | S.E.± | 0.54 | C.D. at 5% | | 1.50 | S.E.± | 0.54 | C.D. at 5% | | 1.51 |

**Table 5:** Interaction effect of land situations & planting geometry, land situations & fertilizer levels, planting geometry & fertilizer levels and land situations, planting geometry and fertilizer levels on grain and straw weight during *kharif* 2017 and 2018

| Treatments | Grain weight hill$^{-1}$(g) | | | | | | | | | | Straw weight hill$^{-1}$(g) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2017 | | | | | 2018 | | | | | 2017 | | | | | 2018 | | | | |
| **LS X PG** | PG1 | PG2 | PG3 | PG4 | PG5 | PG1 | PG2 | PG3 | PG4 | PG5 | PG1 | PG2 | PG3 | PG4 | PG5 | PG1 | PG2 | PG3 | PG4 | PG5 |
| LS1 | 3.93 | 5.52 | 6.57 | 5.20 | 6.27 | 4.63 | 6.29 | 9.56 | 7.96 | 9.40 | 9.83 | 11.38 | 15.18 | 14.62 | 15.09 | 12.21 | 15.67 | 21.53 | 17.94 | 20.71 |
| LS2 | 1.37 | 1.50 | 1.54 | 1.69 | 1.53 | 2.45 | 1.42 | 1.95 | 2.60 | 2.50 | 4.08 | 4.33 | 5.02 | 4.94 | 3.68 | 6.34 | 6.27 | 6.89 | 6.31 | 5.38 |
| LS3 | 3.12 | 3.82 | 6.55 | 5.54 | 6.25 | 3.97 | 3.95 | 8.83 | 6.24 | 7.29 | 5.87 | 7.84 | 13.53 | 11.94 | 12.63 | 10.40 | 11.45 | 16.76 | 13.28 | 12.89 |
| | S.E.± | 0.43 | C.D. at 5% | | 1.24 | S.E.± | 0.33 | C.D. at 5% | | 0.99 | S.E.± | 0.92 | C.D. at 5% | | 2.68 | S.E.± | 0.78 | C.D. at 5% | | 2.55 |
| LS x F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| LS1 | 4.17 | 4.93 | 5.53 | 6.35 | 6.52 | 5.99 | 6.68 | 7.37 | 8.74 | 9.05 | 10.22 | 11.57 | 13.29 | 15.29 | 15.73 | 14.32 | 16.09 | 17.24 | 19.94 | 20.47 |
| LS2 | 0.89 | 0.99 | 1.41 | 2.15 | 2.20 | 1.32 | 1.81 | 2.12 | 2.93 | 2.76 | 3.45 | 3.82 | 3.95 | 4.93 | 5.90 | 5.23 | 5.58 | 6.03 | 7.08 | 7.28 |
| LS3 | 3.96 | 4.53 | 4.97 | 5.84 | 5.99 | 4.79 | 5.36 | 5.79 | 7.22 | 7.13 | 8.37 | 9.37 | 10.50 | 11.75 | 11.82 | 9.91 | 11.07 | 12.83 | 15.28 | 15.68 |
| | S.E.± | 0.30 | C.D. at 5% | | 1.13 | S.E.± | 0.25 | C.D. at 5% | | 0.93 | S.E.± | 0.51 | C.D. at 5% | | 1.89 | S.E.± | 0.67 | C.D. at 5% | | 2.52 |
| PG X F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| PG1 | 2.13 | 2.52 | 2.63 | 3.12 | 3.65 | 2.76 | 3.39 | 3.61 | 4.36 | 4.31 | 5.19 | 5.72 | 6.62 | 7.51 | 7.92 | - | - | - | - | - |
| PG2 | 2.68 | 3.11 | 3.65 | 4.29 | 4.34 | 3.08 | 3.61 | 3.83 | 4.31 | 4.62 | 6.44 | 7.20 | 7.81 | 8.69 | 9.10 | - | - | - | - | - |
| PG3 | 3.40 | 3.89 | 4.82 | 5.82 | 6.01 | 5.07 | 5.80 | 6.48 | 8.23 | 8.61 | 8.06 | 9.43 | 11.16 | 12.64 | 13.28 | - | - | - | - | - |
| PG4 | 3.11 | 3.66 | 4.10 | 4.78 | 5.08 | 4.39 | 4.85 | 5.47 | 6.64 | 6.65 | 8.74 | 9.20 | 10.34 | 11.66 | 12.56 | - | - | - | - | - |
| PG5 | 3.71 | 4.24 | 4.65 | 5.88 | 5.44 | 4.87 | 5.44 | 6.09 | 7.94 | 7.37 | 8.30 | 9.73 | 10.29 | 12.78 | 12.88 | - | - | - | - | - |
| | S.E.± | 0.27 | C.D. at 5% | | 0.77 | S.E.± | 0.22 | C.D. at 5% | | 0.62 | S.E.± | 0.62 | C.D. at 5% | | 1.78 | S.E.± | - | C.D. at 5% | | - |
| LS X PG X F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| LS1 PG1 | 3.08 | 3.69 | 3.52 | 4.24 | 5.15 | 3.78 | 4.18 | 4.32 | 5.42 | 5.42 | 7.72 | 8.42 | 10.44 | 11.06 | 11.51 | 10.70 | 11.14 | 11.87 | 13.54 | 13.82 |
| LS1 PG2 | 4.67 | 4.95 | 5.82 | 6.02 | 6.15 | 5.13 | 6.04 | 6.17 | 6.73 | 7.38 | 9.57 | 10.17 | 11.64 | 12.24 | 13.28 | 13.30 | 13.87 | 14.80 | 17.42 | 18.96 |
| LS1 PG3 | 4.85 | 5.51 | 6.63 | 7.77 | 8.07 | 7.57 | 8.14 | 9.10 | 10.57 | 12.41 | 11.37 | 13.28 | 15.90 | 19.15 | 19.13 | 17.53 | 19.12 | 20.02 | 24.70 | 24.57 |
| LS1 PG4 | 3.79 | 4.78 | 5.23 | 5.80 | 6.38 | 6.36 | 7.19 | 8.26 | 8.96 | 9.02 | 11.91 | 12.93 | 14.43 | 16.66 | 17.17 | 14.32 | 16.03 | 18.37 | 19.95 | 21.03 |
| LS1 PG5 | 4.46 | 5.70 | 6.44 | 7.62 | 7.13 | 7.12 | 7.85 | 9.01 | 12.02 | 11.03 | 10.53 | 13.07 | 14.02 | 17.37 | 16.33 | 16.93 | 20.28 | 21.17 | 23.99 | 24.08 |
| LS2 PG1 | 0.80 | 1.11 | 1.33 | 1.63 | 1.95 | 1.45 | 2.28 | 2.52 | 3.13 | 2.88 | 3.10 | 3.40 | 3.53 | 4.73 | 5.63 | 5.31 | 5.65 | 5.82 | 7.32 | 7.61 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LS2 PG2 | 0.80 | 0.80 | 1.30 | 2.07 | 2.53 | 0.78 | 1.29 | 1.43 | 1.73 | 1.86 | 3.20 | 3.83 | 4.10 | 5.40 | 5.14 | 5.55 | 5.48 | 6.07 | 6.87 | 7.41 |
| LS2 PG3 | 0.80 | 0.90 | 1.53 | 2.10 | 2.37 | 0.78 | 1.44 | 2.05 | 3.37 | 3.72 | 3.93 | 4.23 | 4.50 | 5.38 | 7.07 | 5.98 | 6.36 | 6.88 | 7.52 | 7.69 |
| LS2 PG4 | 1.00 | 1.17 | 1.73 | 2.37 | 2.20 | 1.63 | 1.91 | 2.37 | 2.64 | 2.86 | 4.03 | 4.32 | 4.03 | 5.50 | 6.80 | 4.71 | 5.63 | 6.23 | 7.72 | 7.24 |
| LS2 PG5 | 1.03 | 0.97 | 1.17 | 2.57 | 1.93 | 1.94 | 2.15 | 2.20 | 3.42 | 2.80 | 3.00 | 3.33 | 3.57 | 3.63 | 4.87 | 4.59 | 4.77 | 5.17 | 5.95 | 6.43 |
| LS3 PG1 | 2.50 | 2.77 | 3.03 | 3.48 | 3.83 | 3.03 | 3.70 | 3.97 | 4.53 | 4.64 | 4.77 | 5.33 | 5.88 | 6.75 | 6.63 | 6.17 | 7.83 | 10.57 | 12.93 | 14.50 |
| LS3 PG2 | 2.57 | 3.59 | 3.82 | 4.78 | 4.33 | 3.32 | 3.49 | 3.88 | 4.47 | 4.62 | 6.56 | 7.61 | 7.68 | 8.43 | 8.89 | 8.78 | 9.37 | 11.58 | 12.73 | 14.77 |
| LS3 PG3 | 4.53 | 5.25 | 6.30 | 7.30 | 7.88 | 6.85 | 7.83 | 8.29 | 10.61 | 10.57 | 8.87 | 10.78 | 13.08 | 15.56 | 14.65 | 15.23 | 16.00 | 16.83 | 18.03 | 18.40 |
| LS3 PG4 | 4.54 | 5.02 | 5.34 | 6.18 | 6.64 | 5.18 | 5.46 | 5.78 | 7.23 | 7.55 | 10.28 | 10.34 | 12.57 | 12.83 | 13.71 | 9.67 | 10.47 | 12.77 | 15.20 | 14.75 |
| LS3 PG5 | 3.08 | 3.69 | 3.52 | 4.24 | 5.15 | 5.54 | 6.31 | 7.05 | 9.25 | 8.28 | 11.38 | 12.78 | 13.28 | 15.17 | 14.53 | 10.38 | 11.70 | 12.40 | 17.13 | 16.37 |
| | S.E.± | 0.32 | C.D. at 5% | | 0.89 | S.E.± | 0.29 | C.D. at 5% | | 0.80 | S.E.± | 0.61 | C.D. at 5% | | 1.71 | S.E.± | 0.59 | C.D. at 5% | | 1.66 |

**Table 6:** Interaction effect of land situations & planting geometry, land situations & fertilizer levels, planting geometry & fertilizer levels and land situations, planting geometry and fertilizer levels on grain yield during *kharif* 2017 and 2018

| Treatments | Grain yield (q ha-1) | | | | | | | | | | Pooled mean | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2017 | | | | | 2018 | | | | | | | | | |
| **LS X PG** | PG1 | PG2 | PG3 | PG4 | PG5 | PG1 | PG2 | PG3 | PG4 | PG5 | PG1 | PG2 | PG3 | PG4 | PG5 |
| LS1 | 21.04 | 20.26 | 27.15 | 20.25 | 24.86 | 29.06 | 29.47 | 30.39 | 29.76 | 30.16 | 25.60 | 24.66 | 28.46 | 25.32 | 27.16 |
| LS2 | 3.43 | 4.12 | 5.46 | 3.48 | 5.03 | 6.64 | 6.71 | 15.49 | 7.57 | 10.20 | 5.04 | 5.84 | 10.48 | 5.87 | 6.84 |
| LS3 | 19.83 | 19.49 | 18.48 | 20.69 | 20.11 | 19.11 | 21.56 | 28.96 | 23.37 | 25.47 | 19.47 | 20.52 | 24.54 | 21.98 | 22.03 |
| | S.E.± | 1.01 | C.D. at 5% | | 2.77 | S.E.± | 0.68 | C.D. at 5% | | 2.01 | S.E.± | 0.63 | C.D. at 5% | | 1.70 |
| LS x F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| LS1 | 17.44 | 20.51 | 23.35 | 25.82 | 26.45 | 24.10 | 26.76 | 29.91 | 33.74 | 34.33 | 20.77 | 23.63 | 26.63 | 29.78 | 30.39 |
| LS2 | 2.62 | 2.93 | 3.74 | 5.73 | 6.50 | 5.40 | 7.15 | 9.82 | 12.05 | 12.20 | 4.01 | 5.04 | 6.78 | 8.97 | 9.28 |
| LS3 | 14.58 | 17.81 | 19.51 | 23.19 | 23.50 | 19.42 | 21.14 | 23.12 | 27.04 | 27.75 | 17.00 | 19.48 | 21.32 | 25.12 | 25.63 |
| | S.E.± | 0.64 | C.D. at 5% | | 1.85 | S.E.± | 0.54 | C.D. at 5% | | 1.57 | S.E.± | 0.42 | C.D. at 5% | | 1.30 |
| PG x F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| PG1 | - | - | - | - | - | 14.91 | 16.59 | 18.74 | 21.11 | 21.83 | 12.59 | 14.50 | 16.86 | 19.35 | 20.23 |
| PG2 | - | - | - | - | - | 15.51 | 17.49 | 19.55 | 21.84 | 22.59 | 13.02 | 15.24 | 17.16 | 19.41 | 20.21 |
| PG3 | - | - | - | - | - | 17.45 | 20.73 | 24.11 | 27.70 | 27.88 | 15.19 | 17.87 | 20.57 | 23.90 | 23.98 |
| PG4 | - | - | - | - | - | 16.13 | 18.14 | 21.17 | 25.55 | 25.62 | 13.43 | 15.75 | 17.99 | 21.74 | 21.41 |
| PG5 | - | - | - | - | - | 17.51 | 18.80 | 21.19 | 25.45 | 25.64 | 15.40 | 16.89 | 18.63 | 22.05 | 22.99 |
| | S.E.± | - | C.D. at 5% | | - | S.E.± | 0.51 | C.D. at 5% | | 1.47 | S.E.± | 0.45 | C.D. at 5% | | 1.29 |
| LS X PG X F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| LS1 PG1 | 14.52 | 17.91 | 21.81 | 25.25 | 25.74 | 25.01 | 27.64 | 30.44 | 32.93 | 34.80 | 19.76 | 22.78 | 26.13 | 29.09 | 30.27 |
| LS1 PG2 | 14.96 | 18.65 | 21.86 | 22.65 | 23.18 | 22.95 | 25.77 | 29.17 | 34.05 | 33.37 | 18.95 | 22.21 | 25.51 | 28.35 | 28.28 |
| LS1 PG3 | 22.96 | 24.55 | 28.40 | 29.36 | 30.51 | 24.11 | 26.49 | 28.32 | 34.73 | 35.17 | 23.53 | 25.52 | 28.36 | 32.04 | 32.84 |
| LS1 PG4 | 14.60 | 18.43 | 20.99 | 24.18 | 23.06 | 23.36 | 27.17 | 32.14 | 34.49 | 34.77 | 18.98 | 22.80 | 26.56 | 29.34 | 28.92 |
| LS1 PG5 | 20.15 | 22.99 | 23.69 | 27.68 | 29.77 | 25.08 | 26.73 | 29.48 | 32.51 | 33.54 | 22.61 | 24.86 | 26.58 | 30.10 | 31.66 |
| LS2 PG1 | 1.92 | 2.16 | 3.17 | 4.68 | 5.21 | 3.56 | 5.35 | 7.13 | 8.61 | 8.56 | 2.74 | 3.76 | 5.15 | 6.65 | 6.88 |
| LS2 PG2 | 2.57 | 3.69 | 3.61 | 4.96 | 5.77 | 6.34 | 6.90 | 7.52 | 7.93 | 9.15 | 4.45 | 5.30 | 5.56 | 6.45 | 7.46 |
| LS2 PG3 | 3.25 | 2.59 | 4.32 | 8.09 | 9.05 | 8.26 | 11.46 | 17.84 | 20.12 | 19.77 | 5.75 | 7.03 | 11.08 | 14.10 | 14.41 |
| LS2 PG4 | 1.94 | 2.21 | 2.66 | 5.28 | 5.30 | 6.23 | 7.51 | 9.52 | 14.41 | 13.35 | 4.09 | 4.86 | 6.09 | 9.85 | 9.33 |
| LS2 PG5 | 3.44 | 3.98 | 4.96 | 5.62 | 7.16 | 2.59 | 4.51 | 7.08 | 9.94 | 9.44 | 3.02 | 4.25 | 6.02 | 7.78 | 8.30 |
| LS3 PG1 | 14.35 | 17.12 | 19.92 | 22.84 | 24.92 | 16.18 | 16.78 | 18.67 | 21.79 | 22.14 | 15.26 | 16.95 | 19.29 | 22.31 | 23.53 |
| LS3 PG2 | 14.04 | 16.65 | 18.88 | 22.83 | 20.70 | 17.25 | 19.80 | 21.95 | 23.54 | 25.26 | 15.65 | 18.22 | 20.42 | 23.43 | 24.90 |
| LS3 PG3 | 12.60 | 17.88 | 18.38 | 23.32 | 24.54 | 19.99 | 24.26 | 27.00 | 33.88 | 28.70 | 16.29 | 21.07 | 22.27 | 28.27 | 29.01 |
| LS3 PG4 | 15.63 | 19.42 | 20.81 | 24.30 | 23.27 | 18.80 | 19.74 | 21.84 | 27.75 | 28.73 | 17.22 | 19.58 | 21.33 | 25.54 | 24.70 |
| LS3 PG5 | 16.27 | 17.99 | 19.57 | 22.66 | 24.07 | 24.86 | 25.14 | 26.17 | 28.25 | 33.94 | 20.56 | 21.57 | 23.29 | 26.02 | 26.00 |
| | S.E.± | 0.81 | C.D. at 5% | | 2.27 | S.E.± | 0.77 | C.D. at 5% | | 2.15 | S.E.± | 0.55 | C.D. at 5% | | 1.55 |

**Table 7:** Interaction effect of land situations & planting geometry, land situations & fertilizer levels, planting geometry & fertilizer levels and land situations, planting geometry and fertilizer levels on straw yield during *kharif* 2017 and 2018

| Treatments | Straw yield (q ha-1) | | | | | | | | | | Pooled mean | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2017 | | | | | 2018 | | | | | | | | | |
| **LS X PG** | **PG1** | **PG2** | **PG3** | **PG4** | **PG5** | **PG1** | **PG2** | **PG3** | **PG4** | **PG5** | **PG1** | **PG2** | **PG3** | **PG4** | **PG5** |
| LS1 | 47.50 | 49.62 | 56.02 | 50.14 | 50.63 | 52.53 | 62.24 | 74.46 | 63.75 | 65.12 | 51.07 | 56.31 | 65.24 | 56.44 | 56.95 |
| LS2 | 8.41 | 9.79 | 13.13 | 11.69 | 12.30 | 17.07 | 22.36 | 26.22 | 15.36 | 16.39 | 12.74 | 14.04 | 19.26 | 14.24 | 16.08 |
| LS3 | 27.33 | 28.00 | 42.00 | 31.26 | 33.72 | 30.70 | 36.04 | 41.37 | 39.90 | 41.16 | 29.02 | 33.95 | 41.58 | 34.88 | 36.31 |
| | S.E.± | 1.02 | C.D. at 5% | | 2.99 | S.E.± | 0.67 | C.D. at 5% | | 1.91 | S.E.± | 0.60 | C.D. at 5% | | 1.73 |
| LS x F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| LS1 | 38.85 | 44.53 | 51.73 | 58.56 | 60.24 | 54.23 | 58.83 | 63.15 | 70.45 | 71.44 | 46.54 | 51.68 | 57.44 | 64.51 | 65.84 |
| LS2 | 8.14 | 9.15 | 10.90 | 13.42 | 13.72 | 15.36 | 16.39 | 17.07 | 22.36 | 26.22 | 11.48 | 12.98 | 15.04 | 18.25 | 18.60 |
| LS3 | 26.35 | 28.41 | 31.87 | 38.10 | 37.58 | 30.70 | 36.04 | 39.90 | 41.16 | 41.37 | 28.58 | 31.20 | 34.32 | 40.80 | 40.84 |
| | S.E.± | 0.50 | C.D. at 5% | | 1.44 | S.E.± | 0.48 | C.D. at 5% | | 1.39 | S.E.± | 0.35 | C.D. at 5% | | 1.04 |
| PG x F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| PG1 | 20.95 | 24.09 | 27.30 | 32.80 | 33.59 | 32.57 | 35.01 | 37.34 | 41.31 | 41.93 | 26.76 | 29.55 | 32.32 | 37.06 | 37.76 |
| PG2 | 23.39 | 25.93 | 29.27 | 33.51 | 33.58 | 28.94 | 32.99 | 36.66 | 46.11 | 46.62 | 26.16 | 29.46 | 32.96 | 39.81 | 40.10 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PG3 | 28.59 | 30.47 | 34.31 | 40.09 | 40.41 | 39.63 | 42.86 | 47.42 | 53.16 | 53.69 | 32.09 | 35.69 | 40.78 | 46.00 | 46.80 |
| PG4 | 24.75 | 27.81 | 32.47 | 38.22 | 38.40 | 30.99 | 35.99 | 38.22 | 42.86 | 43.86 | 27.87 | 31.90 | 35.35 | 40.54 | 41.13 |
| PG5 | 24.56 | 28.52 | 34.14 | 38.84 | 39.92 | 34.32 | 35.89 | 38.88 | 44.95 | 45.62 | 31.46 | 33.18 | 36.59 | 42.52 | 43.01 |
| | S.E.± | 0.71 | C.D. at 5% | | 2.05 | S.E.± | 0.47 | C.D. at 5% | | 1.35 | S.E.± | 0.43 | C.D. at 5% | | 1.23 |
| LS X PG X F | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 | F1 | F2 | F3 | F4 | F5 |
| LS1 PG1 | 34.76 | 42.08 | 47.16 | 55.74 | 57.74 | 57.13 | 61.24 | 65.05 | 70.84 | 71.34 | 45.95 | 51.66 | 56.10 | 63.29 | 64.54 |
| LS1 PG2 | 38.38 | 43.43 | 51.31 | 57.27 | 57.70 | 41.01 | 47.02 | 52.29 | 60.89 | 61.45 | 39.69 | 45.22 | 51.80 | 59.08 | 59.57 |
| LS1 PG3 | 41.22 | 44.18 | 49.74 | 64.31 | 66.59 | 66.61 | 69.20 | 75.16 | 80.17 | 81.16 | 53.76 | 59.17 | 67.17 | 72.24 | 73.88 |
| LS1 PG4 | 38.97 | 43.82 | 51.28 | 57.71 | 58.91 | 51.22 | 60.56 | 62.34 | 71.45 | 73.19 | 45.10 | 52.19 | 56.81 | 64.58 | 66.05 |
| LS1 PG5 | 40.92 | 49.13 | 59.17 | 57.75 | 60.26 | 55.16 | 56.15 | 60.90 | 68.92 | 70.08 | 48.19 | 50.17 | 55.32 | 63.34 | 65.17 |
| LS2 PG1 | 5.70 | 6.47 | 7.90 | 10.97 | 11.02 | 13.42 | 14.67 | 16.58 | 20.03 | 20.67 | 9.56 | 10.57 | 12.24 | 15.50 | 15.84 |
| LS2 PG2 | 7.38 | 8.37 | 9.32 | 11.91 | 11.99 | 15.24 | 18.94 | 22.00 | 27.65 | 27.95 | 11.31 | 13.66 | 15.66 | 19.78 | 19.97 |
| LS2 PG3 | 8.90 | 9.58 | 11.14 | 14.41 | 14.43 | 21.07 | 23.08 | 25.86 | 30.50 | 30.60 | 15.14 | 16.78 | 19.19 | 22.29 | 22.91 |
| LS2 PG4 | 9.49 | 10.86 | 13.62 | 15.71 | 15.95 | 12.22 | 13.60 | 15.52 | 17.40 | 18.03 | 10.85 | 12.23 | 14.57 | 16.56 | 16.99 |
| LS2 PG5 | 9.22 | 10.48 | 12.51 | 14.07 | 15.23 | 12.21 | 13.76 | 15.93 | 19.85 | 20.19 | 10.56 | 11.67 | 13.53 | 17.14 | 17.30 |
| LS3 PG1 | 22.40 | 23.72 | 26.85 | 31.69 | 32.02 | 27.16 | 29.11 | 30.39 | 33.07 | 33.78 | 24.78 | 26.42 | 28.62 | 32.38 | 32.90 |
| LS3 PG2 | 24.41 | 25.99 | 27.18 | 31.35 | 31.06 | 30.56 | 32.99 | 35.67 | 49.31 | 49.80 | 27.49 | 29.49 | 31.43 | 40.58 | 40.76 |
| LS3 PG3 | 35.66 | 37.64 | 42.04 | 46.56 | 48.10 | 31.21 | 36.29 | 41.22 | 48.81 | 50.47 | 27.37 | 31.11 | 35.98 | 46.57 | 47.09 |
| LS3 PG4 | 25.78 | 28.75 | 32.52 | 41.24 | 40.32 | 29.53 | 33.82 | 36.81 | 39.72 | 40.35 | 27.66 | 31.28 | 34.67 | 40.48 | 40.34 |
| LS3 PG5 | 23.53 | 25.94 | 30.74 | 38.14 | 37.93 | 35.60 | 37.75 | 39.82 | 46.07 | 46.58 | 35.63 | 37.70 | 40.93 | 43.47 | 43.62 |
| | S.E.± | 0.76 | C.D. at 5% | | 2.13 | S.E.± | 0.63 | C.D. at 5% | | 1.77 | S.E.± | 0.75 | C.D. at 5% | | 2.23 |

## Conclusion
On the basis of investigation, it can be concluded that the finger millet crop should be grown during *kharif* season on upland situation (well drained) followed by gently sloppy land (*Varkas*) with 25 cm x 10 cm planting geometry along with application of fertilizer dose @ 100: 50: 50 NPK kg ha$^{-1}$ with FYM 5 t ha$^{-1}$ for obtaining maximum yield attributing characters, yield and quality under south *Konkan* condition.

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