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WEEDS MANAGEMENT IN MAIZE HYBRIDS WITH NIGHT PLOWING

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ABSTRACT

An experiment was conducted at Agricultural Research Station Buner, Khyber Pakhtunkhwa Pakistan during 2014 to study the effect of plowing time i.e. in dark (at night) and in sunlight (at day) and sowing time i.e. immediate after plowing and 12 hours later, on various maize hybrids. Two fields were selected for day and night plowing. Night plowing was done at 10.00 p.m. while day plowing at 8.00 a.m. Furthermore, half of the plowed field in each case was sown immediately after plowing and the rest, 12 hours later. Three hybrids of maize i.e. Monsanto-2021, Rafhan-3313 and Rafhan-3304 were sown in each field under two factorial randomized complete block design (RCBD) with four replications. Generally a significant interaction among plowing and sowing time was observed for the recorded parameters. Fewer weeds infestation (90 gm^{-2}) was observed for the field plowed at night. Day time plowing increased weeds infestation (247 gm^{-2}); however, heavier 1000 grains (307 g), greater shelling percentage (78.8%), and highest grain yield (8242 kg ha^{-1}), were recorded for the field plowed at night. There were also significant differences among various hybrids, where Monsanto-2021 produced better results. Plowing the field at night proved superior in term of weeds reduction, grain yield and crop growth rate as compared to the field plowed at usual daytime. Night plowing is recommended to decrease weeds emergence and to increase grains and stovers yield. Sowing can be done immediately after night plowing or on subsequent day of plowing. Hybrids particularly, Monsanto-2021 is recommended for maximum yield and yield components.

Key words: grain yield, maize hybrid, night plowing, weed control.

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INTRODUCTION

Maize (*Zea mays* L.) belongs to family Poaceae which is one of the leading cereal crops grown in all districts of Khyber Pakhtunkhwa (KP) Pakistan including Mansehra (Hazara) and Buner valley which are equally famous for maize cultivation. It might be due to the regional farming system, climatic conditions and its consumptive demand for grains (Shah *et al.,* 2009).

The existing maize yield is quite low in the whole (KP) province due to many reasons. One of the main reasons of this low yield is high weeds infestation. Weeds compete with maize for space, light, nutrients as well as water. High rainfall further restricts its eradication at proper stage of the crop growth. Dormancy is a state of inhibiting germination of a viable seed even if climatic conditions are favorable. It could be due to seed coat characteristics, embryo characteristics and presence of inhibitors or unavailability of light. Most of weed seeds belong to family Poaceae and by exposing its seeds to light could break the dormancy. Plowing land at day time in hot summer not only breaks the dormancy of weed seeds but also expedite the process of weed germination (Milberg, 1997). The already existed weed seeds are relatively turgid and start germination when exposed to light during the plowing. In comparison to that of main crop, the early weed establishment is mostly common in all fields. This enables weeds to dominate on the main crops in early developmental phase.

Soil preparation in the absence of light (at night) has not only reduced weeds emergence rate but also allow the main crops to germinate relatively early by providing sufficient moisture to the main crops and particularly to the maize which has larger seeds and are planted in extreme hot months of the summer. Plowing in night also has an advantage to conserve unusual moisture losses from the field, which enables the maize to complete germination process faster with minimum duration than plowing in daytime. Maize seeds are relatively larger and needs sufficient moisture to complete germination. Summer in KP province is relatively hot and creates considerable loss of soil moisture if fields are plowed at normal daytime. Field preparation in night might ensure sufficient moisture to the crop to complete the process of germination.

Keeping in view the aforesaid facts the present experiment were design to study the effect of plowing time i.e. in dark and in sunlight and sowing time i.e. immediate after plowing and 12 hours later, on various maize hybrids.

MATERIALS AND METHODS

The experiment titled "Weed Managment in maize hybrids with night plowing" was conducted at Buner Khyber Pakhtunkhwa Pakistan

during summer (Kharif season) 2014. The experiment was consisted of two plowing time i.e. in dark (at night) and in sunlight (at day). Furthermore; half of the plowed field was sown immediately after plowing and the rest, 12 hours later in both plowing treatments. For this purpose two fields were selected, one for day time plowing and other for night time plowing. Night plowing was done at 10.00 p.m. while day time plowing at 8.00 a.m. The plowing and sowing times were adjusted according to the following schedule.

Plowing time	Sowing time	Remarks
Night (10.00 p.m.)	Night	Immediately after plowing at 10.00 p.m.
	Day	12 hours later, 10.00 a.m. on subsequent day of plowing
Day (8.00 a.m.)	Day	Immediately after plowing at 8.00 a.m.
	Night	12 hours later, 8.00 p.m. on subsequent night of plowing

Three hybrids namely Monsanto-2021 (H1), Rafhan-3313 (H2) and Rafhan-3304 (H3) were sown in each field under two factorial randomized complete block design (RCBD) with four replications. A basal dose of N: P: K at the rate of 120, 90 and 60 kg ha^{-1} was evenly distributed at sowing time in the whole field as urea, SSP and SOP respectively. Nitrogen was applied in two equally split doses, half at sowing and the rest, at knee height. The sources used for the nutrients were Urea, DAP and SOP. Weeding was done once after the canopy closure stage of the crop growth. A net plot size of 5 m x 3.6 m was used which accommodated 6 rows of 60 cm apart.

A seed rate of 25 kg ha^{-1} was used. Seeds were sown manually in furrows and covered thereafter immediately. Irrigation was done as per crop water requirement. All standard agronomic practices were adopted during the experiment for all treatments. The following observations were recorded during the crop growth period.

Dry weed mass (g m^{-2})

A meter square sample was harvested randomly from each experimental unit once after the canopy closure. The collected samples were dried at 60^{o}C for 40 hrs to record the dry weight of weed mass.

Number of grains cob^{-1}

Five cobs samples were randomly selected in each treatment, shelled and number of grains were counted and their average was worked out.

Thousand grain weight (g)

Thousand grains were randomly picked from the shelled grains of each treatment and their weight was recorded.

Shelling percentage

Ten cobs were taken, sun dried and shelled. The shelling percentage was calculated for each treatment by the following formula.

$$\text{Shelling percentage} = \frac{\text{Grain weight of ten cobs x 100}}{\text{Total weight of ten cobs}}$$

Grain yield (kg ha^{-1})

The two central rows in each treatment were harvested at maturity to record grain yield. The cobs were husked, dried and threshed. After threshing the grain weight was recorded. The grain weight was converted to grain yield kg ha^{-1} by the following formula.

$$\text{Grain yield} = \frac{\text{Grain yield (kg) in two central rows x 10000 } m^2}{\text{Number of rows harvested x row length x width}}$$

Statistical Analysis

Data obtained was statistically analyzed by the procedure of Steel and Torrie (1980) using Statistix package 8.1.

RESULTS AND DISCUSSION

Weed dry mass (g m^{-2})

Data pertaining to weed dry mass per unit area as affected by plowing time and sowing time is given in Table-1. Analysis of variance of the data indicated that plowing and sowing time (PS) had significantly affected weed dry mass per unit area. There were no significant differences among the hybrids (H) and their interaction with plowing and sowing time (PSxH) for weed dry mass per unit area. The highest weed dry mass (260 gm^{-2}) was recorded for the field plowed at usual daytime and sown immediately followed by (235 gm^{-2}) the same field sown 12 hours later. The lowest weeds dry mass (80 gm^{-2}) was recorded when the field was plowed at night and sown immediately. From the detailed study of the ANOVA, it was cleared that plowing time had significantly affected weed mass m^{-2} while sowing time had no effect. Comparison of the planned means between plowing time showed that more weed dry mass (247 gm^{-2}) was recorded for the field plowed at usual daytime while less (90 gm^{-2}) for the field plowed at night. There was significant interaction between plowing and sowing time. The field plowed at night and sown immediately reduced weed dry mass compared to the daytime plowing and immediate sowing.

Sowing time had no effect on weed biomass production. The highest weed dry mass was recorded for the field plowed at daytime. The lowest weeds dry mass was recorded when the field was plowed at night. There was significant interaction between plowing and sowing time. The field plowed at night and sown immediately reduced weeds biomass production per unit area compared to the daytime plowing and immediate sowing. Dormancy is a state of inhibiting germination

of a viable seed even if climatic conditions are favorable. It could be due to seed coat characteristics, embryo characteristics and presence of inhibitors or unavailability of light. Most of weed seeds belong to family poaceae and by exposing its seeds to light could break the dormancy. Plowing land in usual duration in hot summer not only breaks dormancy of weed seeds but also expedite the process of weed germination. The already existed weed seeds are relatively turgid and start germination when exposed to light during plowing. Soil preparation in the absence of light significantly reduce weeds emergence rate. Salisbury and Ross (1992) reported that most species which germinate in response to light are not deliberately cultivated species and have small seedlings which may not emerge from the soil before their seed reserves are exhausted. A large proportion of weeds are in this category. In contrast, crop seeds in general will germinate in complete darkness. Ascard and Thomas (1993) reported that weed emergence was significantly reduced by 63 % when tillage was performed in daylight with a light proof cover on the harrow, compared to harrowing in daylight without a cover.

The germination of many weed species in a newly sown crop can be reduced if the final cultivation is undertaken at night. Ordinary daylight cultivation briefly exposes weed seeds to light before they are reburied. Exposure to light breaks the dormancy of the seeds, which then germinate. Exposure periods as short as a millisecond are sufficient to break the dormancy and initiate germination of many species. At night the seeds are not exposed to light, and no germination occurs. Hartmann and Nezadal (1990) found that weed cover in intensively cultivated land in North Bavaria (Germany) could be reduced from 80-2 % if cultivation was carried out during darkness. More recently, scientists at the University of Bonn have demonstrated that strips of land plowed in darkness had five times fewer weeds than similar strips plowed in daylight. Klaffke (1998) reported that night plowing of wheat crops resulted in weed populations so low that herbicide treatment proved unnecessary. These German researchers have developed a shielding device which prevents exposure of seeds during daylight cultivation, but it is not as effective as night cultivation. Milberg (1997) found that broadleaf dock seedlings emerged quickly, in a concentrated flush, when given a light exposure treatment. Fewer seeds germinated and emergence was delayed by treatment in darkness. There is a pronounced light effect threshold in this species; at light levels below the threshold germination does not occur at all.

Number of grains cob^{-1}

Number of grains cob^{-1} is an important yield component. Data regarding number of grains cob^{-1} of various maize hybrids as affected

by plowing and sowing time is given in Table-2. Statistical analysis of the data illustrated that plowing and sowing time (PS) had significantly affected number of grains cob^{-1}. The interaction of plowing and sowing time and hybrids (PSxH) was also significantly different for number of grains cob^{-1}. The analysis also proved that there were significant differences among the hybrids for number of grains cob^{-1}.

More number of grains cob^{-1} (641) was recorded for the field plowed at night and sown immediately, followed by the same field sown 12 hours later which produced 605 grains cob^{-1}. The field plowed at usual daytime and sown immediately produced less (538) number of grains cob^{-1}. More (624) grains cob^{-1} was recorded for H1, followed by (589) H2. Less number of grains cob^{-1} (547) was recorded for H3. The interaction of plowing and sowing time and hybrids (PSxH) revealed that all hybrids produced more grains cob^{-1} when sown immediately after plowing at night, followed by the same treatment sown 12 hours later. Lower number of grains cob^{-1} was recorded for the treatment sown immediately after plowing at usual daytime.

The thorough study of the ANOVA proved that the significant effect on number of grains cob^{-1} was due to plowing time while sowing time showed no effect. There was a significant interaction between plowing and sowing time (PxS) for number of grains cob^{-1}. The interaction explained that more grains cob^{-1} was recorded for night time plowing and immediate sowing compared to daytime plowing and immediate sowing. It is obvious from planned means comparison that more (623) grain cob^{-1} was recorded for night time plowing as compared to daytime plowing (550). Number of grains cob^{-1} was significantly affected by plowing time. Better results were recorded for all of the above mentioned parameters when the field was plowed at night. Inferior observations were obtained for the field plowed at daytime. The interaction of plowing and sowing time significantly affected the mentioned observations. The good results which were obtained for the field plowed at night might be due to high moisture contents for germination and emergence which resulted rapid crop growth rate at the beginning. Lower weed infestation further favored the availability of sufficient nutrients, light, water and air to the main crop and assimilate distribution rate was high. Higher weeds infestation reduces the yield. Such results are reported by Cavero *et al*. (1998) who observed that crop yield was reduced by 14-63% due to weed competition.

Table-1. Effect of plowing and sowing time on weed dry mass (g m^{-2}) in various maize hybrids

Plowing time	Sowing time	Hybrids			Mean
		H1	H2	H3	
Night	Immediate	78	80	82	80 d
	12 hrs later	100	102	101	101 c
Day	Immediate	256	262	262	260 a
	12 hrs later	235	233	236	235 b
	Mean	167	169	170	

LSD(0.05) time = 4.64, LSD(0.05) hybrids = NS, LSD(0.05) interaction = NS

Planned means comparison with statistical significance

Contrasts	Weed dry mass (gm^{-2})			Significance
Night vs. day (plowing)	90	vs.	247	**
Immediate vs. late (sowing)	170	vs.	168	NS
Interaction (P x S)	-	-	-	**

H1 = Monsanto-2021, H2 = Rafhan-3313, H3 = Rafhan-3304
NS = Non significant, ** = Significant at 1 % level of probability
Mean values of various categories followed by different letters are statistically different at 5 % level of probability.

Table-2. Effect of plowing and sowing time on number of grains cob^{-1} of various maize hybrids

Plowing time	Sowing time	Hybrids			Mean
		H1	H2	H3	
Night	Immediate	681	643	599	641 a
	12 hrs later	654	603	558	605 b
Day	Immediate	574	540	501	538 d
	12 hrs later	587	572	530	563 c
	Mean	624 a	589 b	547 c	

LSD(0.05) time = 18.93, LSD(0.05) hybrids = 22.65, LSD(0.05) interaction = 25.77

Planned means comparison with statistical significance

Contrasts	Number of grains cob^{-1}			Significance
Night vs. day (plowing)	623	vs.	550	**
Immediate vs. late (sowing)	589	vs.	584	NS
Interaction (P x S)	-	-	-	**

H1 = Monsanto-2021, H2 = Rafhan-3313, H3 = Rafhan-3304
NS = Non significant, **= Significant at 1 % level of probability
Mean values of various categories followed by different letters are statistically different at 5 % level of probability.

Thousand grain weight (g)

Grain weight is an important trait that contributes to the over all grain yield of maize. Data on 1000 grain weight of various maize hybrids as affected by plowing and sowing time is given in Table-3. Statistical analysis of the data showed that plowing and sowing time (PS) as well as their interaction with hybrids (PSxH) had significantly affected 1000 grain weight. The analysis also indicated that various hybrids had significantly different weight of 1000 grains.

The field plowed at night and sown immediately produced heavier grains. The weight of 1000 grains for this treatment was 313 g. A relatively less weight (301 g) of 1000 grains was recorded for the same field sown 12 hours later. The lightest weight (271 g) among the treatments was observed for the field plowed at usual day-time and sown immediately. Heavier 1000 grains (306 g) were recorded for H1, followed by (293 g) H2. The weight of 1000 grains produced by H3 was lightest (279 g). The interaction of plowing and sowing time and hybrids (PSxH) revealed that highest 1000 grain weight was observed for all hybrids when sown immediately after plowing at night, followed by the same field sown 12 hours later. Lowest 1000 grain weight was recorded for all hybrids sown immediately after plowing the field at usual daytime.

Observations acquired from the detailed study of the ANOVA showed that plowing time had significantly affected 1000 grain weight while the effect of sowing time was not significant. The interaction of plowing and sowing time (PxS) revealed that plowing the field at night and sowing immediately produced heavier grains compared to daytime plowing and immediate sowing. The planned means comparison made it clear that weighty 1000 grains (307 g) was recorded for the field plowed at night. Lowest 1000 grain weight (278 g) was observed for the field plowed at usual daytime.

Thousand grain weight was significantly affected by plowing time. Better results were recorded for all of the above mentioned parameters when the field was plowed at night. Inferior observations were obtained for the field plowed at daytime. The interaction of plowing and sowing time significantly affected the mentioned observations. The good results which were obtained for the field plowed at night might be due to high moisture contents for germination and emergence which resulted rapid crop growth rate at the beginning. Lower weed infestation further favored the availability of sufficient nutrients, light, water and air to the main crop and assimilate distribution rate was high. Higher weeds infestation reduces the yield. Such results are reported by Cavero *et al*. (1998) who observed that crop yield was reduced by 14-63% due to weed competition.

Shelling percentage

Data related to shelling percentage of various maize hybrids as affected by plowing and sowing time is available in Table-4. Analysis of the data illustrated that plowing and sowing time (PS) had significantly affected shelling percentage. The interaction among plowing and sowing time and hybrids (PSxH) also significantly affected shelling percentage. The ANOVA also interpreted that various hybrids had significantly different shelling percentage.

Highest shelling percentage (79.9%) was recorded for the field plowed at night and sown immediately, followed by (77.7%) the same field sown 12 hours later. The lowest (70.9%) shelling percentage was recorded for the treatment plowed at usual daytime and sown immediately. Greater (78.6%) shelling percentage was recorded for H1, followed by (75.2%) H2. The lowest (72.8%) shelling percentage was recorded for H3. The interaction between plowing and sowing time and hybrids (PSxH) indicated that all hybrids showed better shelling percentage when sown immediately after plowing at night, followed by the same treatments sown 12 hrs later. Lowest shelling percentage was recorded for plowing at daytime followed by immediate sowing.

The detailed study of the ANOVA revealed that plowing time resulted in significantly different shelling percentage. No significantly different observations were recorded for sowing time. The detailed study of the ANOVA also showed that the interaction of plowing time and sowing time (PxS) significantly affected shelling percentage. Greater shelling percentage was recorded when the field was plowed at night and sown immediately compared to daytime plowing and immediate sowing. Planned means comparison among plowing time showed that greater (78.8%) shelling percentage was recorded for the field plowed at night and the lowest (72.3%) for the daytime.

The analysis of variance of the data illustrated that plowing time resulted in significantly different shelling percentage. Sowing time had almost the same effect on shelling percentage. Highest shelling percentage was recorded for the field plowed at night. The lowest shelling percentage was recorded for the treatment plowed at daytime. The interaction of plowing and sowing time significantly affected shelling percentage. Greater shelling percentage was recorded when the field was plowed at night and sown immediately compared to daytime plowing and immediate sowing. This high shelling percentage for the field plowed at night might be the result of high moisture contents for germination and emergence, minimum weed mass which favored sufficient nutrients, light, water and air to the main crop. Silveira *et al.* (1993) reported that weeds competition significantly reduced the amount of nitrogen, calcium, magnesium and potassium in the leaf tissue of maize.

Table-3. Effect of plowing and sowing time on 1000 grain weight (g) of various maize hybrids

Plowing time	Sowing Time	Hybrids			Mean
		H1	H2	H3	
Night	Immediate	330	310	300	313 a
	12 hrs later	316	301	285	301 b
Day	Immediate	283	275	256	271 d
	12 hrs later	295	285	275	285 c
	Mean	306 a	293 b	279 c	

LSD(0.05) time = 1.55, LSD(0.05) hybrids = 1.97, LSD(0.05) interaction = 2.24

Planned means comparison with statistical significance

Contrasts	1000 grain weight (g)			Significance
Night vs. day (plowing)	307	vs.	278	**
Immediate vs. late (sowing)	292	vs.	293	NS
Interaction (P x S)	-	-	-	**

H1 = Monsanto-2021, H2 = Rafhan-3313, H3 = Rafhan-3304
NS = Non significant, **= Significant at 1 % level of probability
Mean values of various categories followed by different letters are statistically different at 5 % level of probability.

Table-4. Effect of plowing and sowing time on shelling percentage of various maize hybrids

Plowing time	Sowing time	Hybrids			Mean
		H1	H2	H3	
Night	Immediate	83.7	79.0	76.9	79.9 a
	12 hrs later	81.2	77.4	74.7	77.7 b
Day	Immediate	74.3	70.3	68.2	70.9 d
	12 hrs later	75.3	74.2	71.6	73.7 c
	Mean	78.6 a	75.2 b	72.8 c	

LSD(0.05) time = 0.67, LSD(0.05) hybrids = 0.39, LSD(0.05) interaction = 0.44

Planned means comparison with statistical significance

Contrasts	Shelling percentage			Significance
Night vs. day (plowing)	78.8	vs.	72.3	**
Immediate vs. late (sowing)	75.4	vs.	75.7	NS
Interaction (P x S)	-	-	-	**

H1 = Monsanto-2021, H2 = Rafhan-3313, H3 = Rafhan-3304
NS = Non significant, **= Significant at 1 % level of probability
Mean values of various categories followed by different letters are statistically different at 5 % level of probability.

Grain yield (kg ha^{-1})

Grain yield is the most important goal and ultimate objective for which cereal crops are grown. Data recorded on grain yield (kg ha^{-1}) of various maize hybrids as affected by plowing and sowing time is available in Table-5. Analysis of variance of the data demonstrated that plowing and sowing time (PS) and their interaction with hybrids (PSxH) had significantly affected grain yield. It is also evident from the ANOVA that significant differences were existed among various hybrids for grain yield.

The field plowed at night and sown immediately produced the highest (8456 kg ha^{-1}) grain yield. The same field sown 12 hours later produced grain yield of 8028 kg ha^{-1}. The lowest (7236 kg ha^{-1}) grain yield was recorded for the field plowed at usual daytime and sown immediately. The data also showed that the highest (8586 kg ha^{-1}) grain yield was recorded for H1, followed by (7708 kg ha^{-1}) H2. H3 produced the lowest (7168 kg ha^{-1}) grain yield among the hybrids. It is apparent from the interaction of plowing and sowing time and hybrids (PSxH) that highest grain yield was recorded for all hybrids when sown immediately after plowing at night. The same treatment sown 12 hours later followed the grain yield, for all hybrids. The interaction showed that the lowest grain yield for all hybrids was recorded for the field sown immediately after plowing at usual daytime.

It is evident from the comprehensive study of the ANOVA that the variation in grain yield was the outcome of plowing time. Sowing time showed no effect on grain yield. The interaction of plowing and sowing time (PxS) had significantly affected grain yield. Highest grain yield was observed for immediate sowing after plowing the field at night. Lowest grain yield was recorded when the field was plowed at daytime and sown immediately. Planned means comparison manifested that plowing the field at night produced more (8242 kg ha^{-1}) grain yield compared to plowing the field at daytime (7400 kg ha^{-1}).

Grain or economic yield is the important character for which cereal crops are grown. Grain yield is a function of shelling percentage, number of cobs per unit area, cob size and weight, number of grains cob^{-1} and grain weight. The data demonstrated that plowing time had significantly affected grain yield. The field plowed at night produced the highest grain yield. The lowest grain yield was recorded for the field plowed at usual daytime. The interaction of plowing and sowing time had significantly affected grain yield. Highest grain yield was observed for immediate sowing after plowing the field at night. Lowest grain yield was recorded when the field was plowed at daytime and sown immediately. The existing maize yield is quite low in the whole province. The major hurdle of this low yield is high weed infestation. Weeds compete with maize for space, light, nutrients as well as water.

High rainfall further restricts its eradication at proper stage of the crop growth. All the basic components of yield were significantly affected by plowing time. Higher values were obtained for all the yield components when plowing was done at night which reflected greater yield. Furthermore, low weeds infestation for night plowing ensured sufficient availability of nutrients to the main crop. These results are in accordance with Taupier *et al.* (1993) who reported that weeds competition significantly reduced the amount of nitrogen, calcium, magnesium and potassium in the leaf tissue of maize. Nawab *et al*. (1997) reported that grain yield was increased by 25.3% in the plots weeded 30 days after emergence as compared to the control plot which was not weeded throughout the growing period of maize. Nawab *et al*. (1999) also reported that grain yield was increased by 25 % in weed free plots as compared to the control plot which was not weeded throughout the growing period of maize.

Table-5. Effect of plowing and sowing time on grain yield (kg ha^{-1}) of various maize hybrids

Plowing time	Sowing time	Hybrids			Mean
		H1	H2	H3	
Night	Immediate	9180	8429	7759	8456 a
	12 hrs later	8914	7813	7356	8028 b
Day	Immediate	8158	7055	6495	7236 d
	12 hrs later	8094	7536	7061	7564 c
	Mean	8586 a	7708 b	7168 c	

LSD(0.05) time = 172.34, LSD(0.05) hybrids = 230.77, LSD(0.05) interaction = 262.47

Planned means comparison with statistical significance

Contrasts	Grain yield (kg ha^{-1})			Significance
Night vs. day (plowing)	8242	vs.	7400	**
Immediate vs. late (sowing)	7846	vs.	7796	NS
Interaction (P x S)	-	-	-	**

H1 = Monsanto-2021, H2 = Rafhan-3313, H3 = Rafhan-3304
NS = Non significant, **= Significant at 1 % level of probability
Mean values of various categories followed by different letters are statistically different at 5 % level of probability.

CONCLUSION

Plowing time had significantly influenced all observed parameters while sowing time showed no impact. Plowing the field at night showed best results in term of weeds reduction and grain yield as compared to the field plowed at usual day time. Maize hybrid i.e. Monsanto-2021 gave better results as compared to other hybrids used in the experiment. Thus it is strongly suggested that, plowing should be done at night to reduce weeds emergence and to increase yield.

Only final plowing should be done at night, sowing can be done either immediately after plowing or on subsequent day of plowing. Hybrids should be used to get high production of maize.

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