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COMPARISON OF DIRECT SEEDED AND TRANSPLANTED SUNFLOWER IN FEBRUARY AND MARCH

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To study the effects of transplanting one, two-and three-week old seedlings and direct seeding on dry, wet and moist seed beds during February and March on sunflower cultivar Sunbred 212, experiments were conducted at Agronomy farm and Malakandhar farm, NWFP Agriculture University, Peshawar during 1981-82.

Head dia. days to maturity and grain yield were significnatly affected by the time of sowing. However, the sowing time did not affect the thousand grains weight. February sown crop produced larger heads and more yield than the March sown crop but took more days to mature. Thousand grains weight was about the same for the two dates. The effects of the stages of transplantation and direct seeding were significant in all the characters studied. Direct seeded crop gave more yield which decreased as the seedling age increased. Direct seeded crop gave more yield in March while the transplanted crop was better in the case of early planting. Methods of sowing did not affect significantly any of the characters.

Key words: Transplantation; Sunflower; Seedlings.

INTRODUCTION

Sunflower (*Helianthus annuus* L.) a new crop with unique oil qualities and yield potential offers considerable opportunity to narrow the gap between the consumption and production of edible oils in Pakistan. Being a new crop detailed work on the cultural practices and time of sowing are urgently needed in order to formulate suitable recomendations for a proper development of the crop. Great stress is being laid from all quarters to fit it into the crop husbandry of our country. As this crop cannot be planted in the field very early due to the danger of late spring frost, transplantation was thought to be a solution to have an early crop in the field.

Limited research work on transplantation has been done in Faisalabad where it has been found that direct seeding gave more yield than the transplanted crop. But the transplanted crop matured earlier than the direct seeded one [4]. Experiments conducted under irrigated conditions at Faisalabad reported by P.A.R.C. [1] revealed high yields in March. February ranked second while low yields were obtained from the January sown crop. Lehman *et al.* [5] in a trial conducted at California reported high yields in February and low yields in March. Days to maturity also decreased from February to July. High yields in January-February and low in March have also been reported by Shaikh and Chaudhry [6]. Days to maturity also decreased for March sown crop. A sowing date trial at D.I. Khan conducted by P.A.R.C. [1] revealed that sunflower should be planted in March and July under D.I. Khan conditions.

No one has worked on this problem in this part of the country. The experiment reported in this paper was therefore, designed to study the effect of transplantation vs direct seeding on grain yield and maturity of sunflower.

MATERIALS AND METHODS

The experiment was conducted on sunflower Hybrid Sunbred 212 at the Malakandhar farm and the agronomy farm of the NWFP Agricultural University, Peshawar, during 1982. Transplanting using one-tow-and three-week old seedlings along with direct seeding of the same seed source was done on dry, wet and moist seed beds in February and March. Seedlings grown in nursery beds were uprooted with a ball of earth and transplanted in the field. In the case of dry sowing the plots were irrigated after sowing and transplanting. A small amount of water was applied to the seedlings transplanted on moist plots. The experiment was laid out in split-split-plot design with three replications. Times of sowing were alloted to main-plots,

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methods of sowing to sub-plots and stages to sub-sub-plots. A sub-sub-plot size of 3.75m x 4.5m, having five rows 4.5 meter long was used. The distance between rows was kept 75 cm while plants were spaced 30 cm apart within the rows. The first sowing was done on February 21 and 22 and the second sowing on March 13 and 14 at the agronomy research plots and the Malakandhar farm respectively. Seedlings of desired age were obtained by sowing nurseries on first, 10th and 20th January for transplanting in February and on 3rd, 12th and 20th February for transplantation in March.

A basic dose of 100 kg N and 50 kg phosphorus per hectare was applied in the form of nitrophos and urea. Nitrophos was applied at the time of seed bed preparation while urea was applied before the flowering stage. Irrigation water was applied when needed. The success of transplantation was more than 95%. Two hoeings were done for controlling weeds. Data were recorded on head dia., days to maturity, thousand grains weight and grain yield.

Data on head dia. were recorded by measuring the head dia. with a scale. Five representative plants per sub-sub-plot were used for recording head dia. Days to maturity were calculated from the date of sowing and the date of about 95 % disc maturity. Thousand grains were counted and weighed to calculate thousand grains weight. The February and March sown crops were harvested on June 28 and July 3 respectively, when the colour of the back of the flower disc became yellowish brown. For calculating the yield per sub-sub-plot the three central rows of each sub-sub-plot were harvested, dried and weighed. Plot yield was multiplied by a factor calculated from the area harvested to obtain yield per hectare.

RESULTS AND DISCUSSION

Head diameter. The heads of the plants sown during the month of February were generally larger than those of March sown plants the differences were significant at both the locations (Table 1).

The head dia. was much affected by transplantation

Table 1. Head dia. of sunflower in con. as affected by sowing, time stages of transplantation and methods of sowing

Sowing time	Sowing method	Transplantation stages: One week seedlings	Two weeks seedlings	Three weeks seedlings	Direct seedlings	Mean
		Agronomy Research Plots				
Feb.		21.6a*	18.6e	16.1e	21.7a	19.5f
March		19.6b	17.7d	15.8e	20.1b	18.4g
	Dry	20.71	18.6m	16.1q	21.31	19.1
	Wet	20.51	18.2m	16.20	20.91	19.0
	Moist	21.01	17.6n	15.6p	20.61	18.7
	Mean	20.8w	18.2x	15.9y	20.9w	
		Malakandhar Farm				
Feb.		21.1a	18.1c	15.6e	21.3a	19.0e
March		19.5b	17.2d	15.3e	19.7b	17.9f
	Dry	20.41m	17.8n	15.6p	20.71	18.6
	Wet	20.1m	18.0n	15.6p	20.41m	18.5
	Moist	20.41m	17.2o	15.1q	20.41m	18.3
	Mean	20.3w	17.7x	15.4y	20.5w	

***Means of the same category followed by different letters are significantly different at 5 % level using Duncan's New Multiple Range Test.**

of the seedlings at different ages and direct sowing. The largest heads were produced by plants in the direct seeded plots, while plants with smallest heads resulted from transplantation of three-week old seedlings. Transplantation of one-week old seedlings produced as large heads as those of direct seeded crop. The head dia. decreased with increase in seedling age at both locations. Khan [3] also reported that direct grain sowing produced larger heads than the transplanted crop.

The head dia. was not significantly affected by the methods of sowing. However, on an average, the dry method of sowing resulted in large heads. Large heads were recorded from direct sowing by the dry method while small heads were obtained by moist method of sowing.

Sowing times x transplantation stages interaction was significant at both locations. Early direct sowing and early transplanting of one and two-week produced larger heads than late sowing and transplanting. However, the date of transplanting in the case of three-week old seedlings had no significant effect on head dia.

Days to maturity. Effects of the stages of transplantation and time of sowing were significant (Table 2). Direct seeded crop matured last and days to maturity increased with decrease in seedlings age at the time of transplatation. More days were required for maturity of the crop transplanted in February than that transplanted in March. However, the effect of the condition of the seed bed on maturity was not significant. The interaction between sowing times and stages was significant.

From the data given in the Table it can be concluded that the duration for maturity was more when the crop was sown during February while it become short when sowing was done in March.

The differences in maturity periods of the two sowing and transplanting dates may be due to differences in temperature encountered by the crops sown early and late. The low temperature during the early stages of the February sown crop resulted in slower growth, while higher temperatures resulted in early maturity for the March sown crop. Stages of transplantation of the seedlings also affected the days to maturity. Seedlings which were older required less time for maturity while direct sowing required more time. This may be due to the fact that seeds require some time for germination and establishment while the seedlings which have already germinated in nursery established rapidly and mature earlier than direct sowing. Khan [5] also reported similar results. He also concluded that transplanted crop matures about ten days earlier than the direct seed crop.

Thousand grains weight. Sowing time and method affected the thousand grains weight significantly at both locations (Table 3). The condition of the seed bed did not affect the 1000-grains weight significantly. Interactions between time and stages were significant. March sowing and transplantations produced heavier grain than February sowing and transplantation.

At both locations direct seeded crop and plants transplanted at the age of one week produced grains of about

Table 2. Days to maturity of sunflower as affected by the time of sowing, stages of transplantation and the method of sowing

Sowing time	Sowing method	Transplantation stages: One week seedlings	Two weeks seedlings	Three weeks seedling	Direct seedling	Mean
		Agronomy Research Plots				
Feb.		127.1B*	126.3C	125.0D	128.1A	126.5I
March		111.3F	110.2G	109.1H	112.3E	110.7J
	Mean	119.2X	118.3Y	117.1Z	120.3W	
		Malakandhar Farm				
Feb.		128.3B	127.1C	125.9D	129.4A	123.7I
March		112.3F	111.0G	110.2H	113.3E	111.7J
	Mean	120.3X	119.1Y	118.1Z	121.4W	

*Means of the same category followed by different letters are significantly different using Duncan's New Multiple Range Test (1 % level).

the same weight. The two-week old seedlings produced light grains than the direct seeded crop and from one-week old transplanted seedlings. Three-week old seedlings produced the lightest grains.

Time x stage interactions were significant at both locations. The crop seeded directly in March produced heavy grains than that seeded in February. The three-week old seedling produced about the same size grains from February and March transplantation. One-week old seedlings produced heavy grains when transplanted in February than those transplanted in March. On the other hand, two-week old seedlings produced heavy grains when transplanted in March than in February.

Grain yield. Significant differences in the grain yield of sunflower were observed due to the different times of sowing as well as the stages of transplantation of the seedlings (Table 4). However, the methods of sowing did not significantly affect grain yield at both locations.

The interaction between time and stage was significant at the two experimental sites. Plots sown in February produced significantly more grain yield than those sown in March. The direct seeded crop produced more yield than the transplanted crops at both the location. Comparison among the yields of transplanted plots showed that the yield decreased with increase in the age of the seedlings at the time of transplantation.

High yields were recorded from the direct grain sown crop during March. However, the transplanted seedlings with different ages produced better results when transplantation was done during February.

No significant differences in grains yields were observed due to the three methods of sowing, that is, dry, wet and moist.

Better results were obtained from the agronomy farm. This may be due to the differences in fertility levels of the two sites. The crop was sown in a field previously occupied by the sugar-cane crops at Malakandhar farm while the field at the agronomy farm was previously occupied by

Table 3. Thousand grains weight in grams of sunflower as affected by time of sowing, stages of transplantation and methods of sowing

Sowing time	Sowing method	Transplantation stages: One week seedlings	Two weeks seedlings	Three weeks seedling	Direct seedling	Mean
		Agronomy Research Plots				
Feb.		47.4a*	43.7d	43.1e	45.8b	45.0f
March		46.3b	44.9c	43.9de	47.8a	45.6f
	Dry	46.3	44.5	43.2	46.3	45.1
	Wet	46.8	44.0	43.0	46.8	45.2
	Moist	47.5	44.3	43.5	47.2	45.6
	Mean	46.9w	44.3x	43.2Y	46.8w	
		Malakandhar Farm				
Feb.		47.0ab	43.8de	43.4f	46.3c	45.1g
March		46.4bc	44.2d	43.7ef	47.6a	45.5g
	Dry	46.7	44.0	43.5	47.0	45.3
	Wet	46.3	43.8	43.5	46.8	45.1
	Moist	47.1	44.2	43.5	47.0	45.5
	Mean	46.7w	44.0Y	43.5Y	46.9w	

*Means of the same category followed by different letters are significantly different using Duncan's New Multiple Range Test (capital letters designate differences at the 1 % level and small letters of 5 % level of possibility).

Table 4. Grain yields in kilograms per hectare of sunflower as affected by time of sowing, stages of transplantation and methods of sowing.

Sowing time	Sowing method	Transplantation stages: One week seedlings	Two weeks seedlings	Three weeks seedling	Direct seedling	Mean
		Agronomy Research Plots				
Feb.	Dry	1625	1566	1496	1677	1591
	Wet	1628	1568	1484	1674	1589
	Moist	1628	1566	1486	1684	1591
March	Dry	1510	1485	1476	1687	1540
	Wet	1511	1486	1475	1684	1339
	Moist	1514	1492	1580	1686	1543
Feb.		1627C*	1567D	1489F	1679B	1590H
March		1512E	1488F	1477G	1688A	1541I
	Dry	1567	1526	1486	1682	1565
	Wet	1569	1527	1480	1680	1564
	Moist	1571	1592	1483	1685	1567
	Mean	1569X	1527Y	1483Z	1682W	
		Malakandhar Farm				
Feb.	Dry	1620	1565	1484	1675	1588
	Wet	1625	1567	1484	1673	1587
	Moist	1626	1567	1486	1680	1590
March	Dry	1509	1484	1476	1486	1539
	Wet	1511	1484	1475	1684	1538
	Moist	1512	1491	1483	1684	1542
Feb.		1624C	1566D	1488F	1676B	1588H
March		1511E	1486F	1478B	1684A	1540I
	Dry	1565	1524	1485	1681	1564
	Wet	1568	1525	1480	1678	1563
	Moist	1569	1529	1484	1642	1566
	Mean	1567X	1526Y	1483Z	1680W	

*Means of the same category followed by different letters are significantly different using Duncan's New Multiple Range Test (capital letters designate differences at 1 % level of possibility).

shrubs and trees and had high organic matter content due to the presence of roots and leaves of the trees and shrubs while sugar-cane which is an exhaustive crop reduced the fertility status of the soil.

The results obtained in the experiment in respect of direct grain sowing and transplantation agree with the results obtained by Khan [3] who reported that direct grain sowing produced more grain yield than the transplanted crop.

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