



INFLUENCE OF LATE PLANTING DATES AND PLANTING METHODS ON SEED PRODUCTION OF CLOVERS

Hasina Gul¹, Beena Saeed², Ahmad Said¹, Fida Mohammad³ and Ijaz Ahmad³

¹Office of the Assistant Agronomist (Farm), Agricultural Research Institute, Tarnab, Peshawar, Pakistan

²Department of Agronomy, Khyber Pakhtunkhwa Agricultural University, Peshawar, Pakistan

³Department of Plant Breeding and Genetics, Khyber Pakhtunkhwa Agricultural University, Peshawar, Pakistan

E-Mail: ijaz132@yahoo.co.uk

ABSTRACT

The present research was conducted for the purpose to find out the effect of different late planting dates (LPD), planting methods and their interaction on seed production of Berseem and Shaftal. The experiment was carried out at Research Farm of Khyber Pukhtunkhwa Agricultural University, Peshawar, Pakistan during 2004-05. The experiment was planted in randomized complete block design (RCBD) with four replications having split plot arrangements. Four late sowing dates (22nd October, 1st November, 11th November and 22nd November) were allotted to main plots and combination of planting methods (line and broadcast) and clovers (Shaftal and Berseem) were allotted to sub-plots. Late planting dates had significant effect on biological yield (kg ha⁻¹) and seed yield (kg ha⁻¹) while number of heads m⁻², number of seed head⁻¹ and 1000 seed weight (g) were not significantly affected by late planting dates. Maximum biological yield (1717 kg ha⁻¹) was produced on 1st November sowing, while minimum biological yield (797 kg ha⁻¹) was on 22nd October. Similarly sowing on 11th November produced highest seed yield (112 kg ha⁻¹) while 1st November sowing produced lowest seed yield (96 kg ha⁻¹). Significant differences were found among the combination of planting methods and clovers (PMC) for biological yield (kg ha⁻¹), number of heads m⁻², number of seeds head⁻¹, seed yield (kg ha⁻¹) and 1000 seed weight (g). Shaftal, sown by line method produced maximum biological yield (1113 kg ha⁻¹), number of seed head⁻¹ (38.2) and 1000 seed weight (2.00 g). Similarly Berseem, sown by line methods produced highest number of heads m⁻² (2046) and seed yield (198 kg ha⁻¹). Shaftal plots planted by broadcast method produced lowest biological yield (791 kg ha⁻¹) and seed yield (19 kg ha⁻¹) while Berseem plots sown by broadcast methods gave minimum number of heads ha⁻¹ (1717), number of seeds head⁻¹ (33.2) and 1000 seed weight (1.76 g). Interactive effects of Shaftal showed better performance under the agro-climatic conditions of Peshawar valley, from 1st November to 11th November by line method. It was concluded from the present study that late sowing of Berseem and Shaftal gave best results from 1st November to 11th November by line method of planting under the irrigated areas of Peshawar valley.

Keywords: clover, berseem, shaftal, seed production, late planting dates, planting methods.

INTRODUCTION

Agriculture is the mainstay and backbone of Pakistan economy, contributing nearly 20.9 % of gross domestic product (GDP) and 43.4 % of the total employment generation. Livestock contributes more than 50 % of agriculture value added, more than the contribution of all other crops (48%) and 11% in national GDP (Economic Survey of Pakistan, 2007).

Low fodder production and lesser feed availability are the major limiting factors for increasing livestock productivity in Pakistan, particularly in Khyber Pukhtunkhwa. Improvement in livestock production depends on the proper quality and quantity of feed (Amanullah *et al.*, 2005).

Berseem and shaftal are the major forages grown in various parts of Pakistan. Berseem (*Trifolium alexandrinum* L.) called "Egyptian clover" belongs to family "Papilionaceae (Leguminosae)" and genus "Trifolium". Berseem is an annual, cool season forage crop. There is a large number of livestock in the country which need a constant supply of fresh forage yield. Due to the extra ordinary regenerative power, berseem gives several cuttings during its growing season and supplies nutritious, palatable and succulent forage for animals. Normally 4-6 cuttings of berseem are taken in Pakistan

(Graves *et al.*, 1996). It is fed either green or in hay form, when seasonal conditions permit. Seed production of berseem is confined to irrigated areas in Pakistan, which plays an important role in farm-economy but the practices of obtaining 4-6 cuttings result in very poor seed yield because multi-cutting exhausts the root reserve and nutrients in the soil. This reduction in seed production has resulted in import of clover seeds (Chaudhry *et al.*, 1994).

Shaftal (*Trifolium resupinatum* L.) has a greater natural world wide distribution than any other member of family "Papilionaceae (Leguminosae)". It is called "Persian clover". It is a winter legume fodder grown in some parts of Pakistan, particularly in Khyber Pukhtunkhwa, cold, irrigated, or heavy rainfall areas. It has been grown in Peshawar valley but on relatively small area. It is not very popular because of its low yield and some indigestion problems to animals. Shaftal is a multi-cut fodder like berseem which can be grown in open range land for grazing. Research findings suggested proper time and method of sowing along with adequate amount of fertilizers like nitrogen, phosphate and potash for the best seed yield (Mukharjee and Mandal, 2000).

Broadcasting and line methods are used for planting berseem and shaftal but broadcast method is used more commonly in Pakistan. Sowing shaftal and berseem



by broadcast method produced better germination, increased plant population, increased number of branches plant⁻¹, more forage and seed yield while late sowing had adverse effect on the green forage yield, seed yield and quality of berseem and shaftal (Narwal and Sardans, 2000).

Similarly sowing of berseem in November by broadcast method, gives maximum green forage yield and seed production (Baig, 2000). Delay in sowing from 1st October to 15th November decreased fresh and dry forage yield but increased the seed yield (Virendra *et al.*, 2000).

Cutting is very important practice for increasing the forage as well as seed yield of berseem and shaftal (Mukharjee and Mandal, 2000).

Improved seed production of berseem and shaftal require proper sowing time and efficient method of planting (Garza and Marquez, 1994).

The recommended sowing date of berseem is last week of September to mid October, while for shaftal the recommended sowing date is October to first week of November; however due to harvesting of summer crops as well as farmers engagements in other field activities planting of clovers is delayed. The present study was designed to determine the effect of late dates of sowing and planting method on berseem and shaftal to get higher seed yield under the irrigated conditions of Peshawar valley.

MATERIALS AND METHODS

An experiment on the "Influence of late planting dates and planting methods on seed production of clovers" was conducted on the local cultivars of shaftal and berseem at Research Farm of Khyber Pukhtunkwa, Agricultural University, Peshawar, Pakistan during 2004-05. The soil of experimental site was silty clay-loam with a clay type montmorillonite, low in nitrogen (0.03-0.04 %), low in organic matter (0.8-0.9%) and alkaline in nature with pH of 8.0-9.2. The experiment was laid-out in Randomized Complete Block Design (RCBD), with split-plot arrangements having four replications. Four planting dates (22nd October, 1st November, 11th November and 22nd November) were allotted to main plots (Factor A) and combination of planting methods (line and broadcast) and clovers (shaftal and berseem) were allotted to sub-plots (Factor B). A sub-plot size of 2.1m x 8m having 7 rows, 8m long with 30cm row spacing were used, respectively. A basal dose of urea @ 20 kg ha⁻¹ was applied at the time of sowing. Four channels were made to irrigate the plots when seeds were broadcasted in standing water. Seeds were also sown in lines before irrigation. A seed rate of 26g and 21g plot⁻¹ of berseem and shaftal was used, respectively. First irrigation was applied at time of sowing, while 2nd irrigation was applied about 12 days after sowing for the best establishment of seedlings.

Data regarding biological yield (kg ha⁻¹), number of heads m⁻², number of seeds head⁻¹, seed yield (kg ha⁻¹) and 1000 seed weight (g) were recorded. Biological yield was recorded by harvesting the whole sub plot and weighed (g sub plot⁻¹) in case of broadcasting method and

then converted into kg ha⁻¹, while in line method of sowing, the biological yield was calculated by harvesting the central three rows and then converted to kg ha⁻¹. Number of heads m⁻² was recorded by counting number of heads in one square meter randomly selected area in each sub plot having broadcast sowing, while in line sowing it was recorded by the following formula:

$$\text{Number of heads m}^{-2} = (\text{Number of heads in three central rows}) / (\text{R-R distance} \times \text{Row length} \times \text{Number of sample row})$$

From the harvested material of biological yield, a sample of five heads was taken, threshed and number of seeds head⁻¹ was recorded in broadcast as well as in line sowing. For recording seed yield, the harvested material was threshed and cleaned properly, which was then weighed and converted to kg ha⁻¹ in both planting methods. Data regarding thousand seeds weight was recorded with the help of electronic balance by counting 1000 seeds. The data were statistically analyzed using analysis of variance for RCBD. Main and interactive effects were separated using LSD test to differentiate the treatments at 5% level of probability.

RESULTS AND DISCUSSIONS

Heads m⁻²

Planting methods and clover (PMC) combination had significant effect on the number of heads m⁻² (Table-1). Maximum number of heads m⁻² (2046 m⁻²) were collected from berseem plots sown by line method while minimum number of heads m⁻² (1717 m⁻²) were recorded for berseem plots sown by broadcast method. One possible argument could be that plots sown by line method had good vegetative growth which in turn resulted in maximum reproductive growth or number of heads m⁻². Secondly it may be due to more secondary and tertiary branches produced on the main plant which bears more heads m⁻² while late planting dates (Table-1) and interactive effects were non significant (Table-2). But Narwal and Sardans (2000) found that number of heads m⁻² increased with delay in sowing and increase in seed rates.

Number of seeds head⁻¹

Combination of planting methods and clovers (PMC) had significant effect on the number of seeds head⁻¹ (Table-1). Maximum number of seeds head⁻¹ (38.2) was recorded in shaftal plots sown by line method, while minimum seeds (33.2 seeds head⁻¹) were collected from berseem plots sown by broadcasting. This could be due to more number of branches plant⁻¹ with more well filled heads and thus resulted in greater number of seeds head⁻¹. Secondly it may be due to suitable temperature during seed development. The late planting dates (Table-1) and the interactive effect were non significant (Table-2), but these results are not in conformity with those of Virendra *et al.*, (1999) who reported that number of seeds head⁻¹ increased with delay in sowing.



Thousand seed weight (g)

Combination of planting methods and clovers (PMC) had significant effect on the thousand seed weight (g) of berseem and shaftal (Table-1). The highest thousand seed weight (2.00g) was produced from shaftal plots having line method of sowing, while lowest thousand seed weight (1.76g) was obtained from berseem plots sown by broadcast method. This might be due to that line method produced more healthy plants which in turn synthesized healthier and plump seed. Secondly it may be due to more favorable environmental conditions. The main values showed that late planting dates (Table-1) and interaction had non-significant effect on the thousand seed weight (g) (Table-2), but the contrasting results were given by Lalie *et al.*, (1999) who reported that thousand seed weight (g) were decreased by delaying the sowing dates. Similarly the opposite results were reported by Virendera *et al.*, (1999) who reported that thousand seed weight (g) increased with delay in sowing.

Biological yield (kg ha⁻¹)

Data regarding biological yield of berseem and shaftal was significantly affected by late planting and planting methods (Table-1). Maximum biological yield (1117 kg ha⁻¹) was obtained at 1st November sowing while minimum biological yield (797 kg ha⁻¹) was obtained from plots sown on 22nd October. The reason may be that more suitable date of sowing for biological yield is the early week of November (Narwal and Sardans, 2000). In this period, the crop gets favorable environmental condition for maximum production of vegetative and reproductive components which in turn results increase in biological yield.

In case of planting methods and clover combination the highest biological yield (1113 kg ha⁻¹) was obtained from shaftal plots which were sown by line method while lowest biological yield (791 kg ha⁻¹) was obtained from shaftal plots sown by broadcasting method. The variation may be due to more reproductive plants unit area⁻¹. Secondly the line method is more suitable method of sowing in both berseem and shaftal clovers. In line method the competition of plants for water and nutrients obtaining is decreased and they get more water and nutrients because of low plant population. The interactive effect of late planting dates, planting methods and clover (PMC) combination had non-significantly affected biological yield (791 kg ha⁻¹) (Table-2).

Seed yield (kg ha⁻¹)

The analysis of variance showed that seed yield (Table-1) was significantly affected by late planting dates, combination of planting methods and clovers and interaction of planting dates and methods (Table-2). The mean values of late planting dates showed that highest seed yield (112 kg ha⁻¹) was recorded on 11th November, while the lowest seed yield (96 kg ha⁻¹) was obtained while sown on 1st November. This might be due to the fact that more number of plants emerged m⁻² with more branches, more well filled heads, sound and plump seeds which in turn yielded into more seed yield. It means that delay sowing gave highest seed yield. The results are in the conformity with Narwal and Sardans (2000) who reported that seed yield increased with delay sowing in berseem and shaftal. Similar results were given by Virendera *et al.*, (2000) who observed that seed yield increased in Egyptian clovers with delay in sowing time. Lalie *et al.*, (1999) reported the contrasting results. They found that average seed yield of berseem decreased by delay in sowing. Similarly mean values of planting methods and clovers (PMC) combination presented that maximum seed yield (198 kg ha⁻¹) was received from berseem plots which were sown by line method while minimum seed yield (19 kg ha⁻¹) was obtained from shaftal plots sown by broadcasting. It may be due to more branching capacity in berseem which produced more reproductive growth. In case of interaction of planting dates and methods, the maximum seed yield (214 kg ha⁻¹) was obtained from berseem plots sown by line method on 11th November while minimum seed yield (19 kg ha⁻¹) was obtained from shaftal plots sown on 22nd October and 1st November by broadcasting method. The possible arguments may be sowing method; more number of branches plant⁻¹ with more number of heads which possess more number of seeds.

CONCLUSION AND RECOMMENDATIONS

It is concluded that sowing of berseem and shaftal from 1st to 11th November by line method gave best growth and seed production. Due to late harvesting of summer crops as well as farmers engagements in other field activities, we recommended planting of berseem and shaftal by line method from 1st to 11th November for getting maximum seed production in agro climatic conditions of Peshawar valley.

**Table-1** Effect of late planting dates and planting methods on various plant characters of berseem and shaftal.

Factors	Heads m ⁻²	Seeds head ⁻¹	Thousand seed weight (g)	Biological yield (kg ha ⁻¹)	Seed yield (kg ha ⁻¹)
Late Planting dates					
22 nd October	1773	36.0	1.94	797b	102ab
1 st November	1910	32.3	1.92	1117a	96b
11 th November	1872	35.9	1.92	891b	112a
22 nd November	1906	37.4	1.74	922b	106ab
LSD	Ns	ns	ns	173.8	10.28
Planting methods and clovers (PMC)					
Line x berseem	2046a	36.8a	1.99a	1030a	198a
Broadcasting x berseem	1717b	33.2b	1.76b	793b	177b
Line x shaftal	1953ab	38.2a	2.00a	1113a	22c
Broadcasting x shaftal	1745b	33.5b	1.77b	791b	19c
LSD	97.20	1.585	0.1178	101.0	9.398

Means of the same category followed by different letters are significantly different at 5% level of probability with LSD test.

Table-2 Interactive effect of late planting dates, planting methods and clovers on heads m⁻², seed head⁻¹, 1000 seeds weight, biological yield (kg ha⁻¹) and seed yield (kg ha⁻¹).

	Heads m ⁻²	Seeds head ⁻¹	Thousand seed weight (g)	Biological yield (kg ha ⁻¹)	Seed yield (kg ha ⁻¹)
Interaction					
22 nd Oct. x line x Berseem	ns	ns	ns	ns	193bc
22 nd Oct. x broadcast x Berseem	ns	ns	ns	ns	175d
22 nd Oct. x line x Shaftal	ns	ns	ns	ns	21f
22 nd Oct. x broadcast x Shaftal	ns	ns	ns	ns	19f
1 st Nov. x line x Berseem	ns	ns	ns	ns	184cd
1 st Nov. x broadcast x Berseem	ns	ns	ns	ns	159e
1 st Nov. x line x Shaftal	ns	ns	ns	ns	22f
1 st Nov. x broadcast x Shaftal	ns	ns	ns	ns	19f
11 th Nov. x line x Berseem	ns	ns	ns	ns	214a
11 th Nov. x broadcast x Berseem	ns	ns	ns	ns	192bc
11 th Nov. x line x Shaftal	ns	ns	ns	ns	22f
11 th Nov. x broadcast x Shaftal	ns	ns	ns	ns	20f
22 nd Nov. x line x Berseem	ns	ns	ns	ns	200ab
22 nd Nov. x broadcast x Berseem	ns	ns	ns	ns	182cd
22 nd Nov. x line x Shaftal	ns	ns	ns	ns	22f
22 nd Nov. x broadcast x Shaftal	ns	ns	ns	ns	20f
LSD	ns	ns	ns	ns	14.02

Means of the same category followed by different letters are significantly different at 5% level of probability with LSD test.

ns = non significant

LSD = Least significant differences



REFERENCES

- Amanullah A. Khan, S. Alam and H. Khan. 2005. Performance of berseem varieties at Peshawar. *Sarhad J. Agric.* 21(3): 317-321.
- Baig M. A. 2000. Effect of cultural practices on the yield of berseem. M. Sc (Hons) Thesis, Sindh Agric. Univ. Jamshoro, Pakistan. pp. 45-46.
- Chaudhry A.R., A. Ghani and M.A. Mukhtar. 1994. Evaluation of two new high yielding varieties of berseem. *Pak. J. Agric. Res.* 12(1): 35-39.
- Economic Survey of Pakistan. 2007. Ministry of Finance, Govt. of Pakistan. 2007. Islamabad. pp. 21-23.
- Garza H.M. and J. J. Marquez. 1994. Effect of dates, densities and methods of sowing on seed yield of berseem clover. *J. Agric. Res.* 90(3): 163-173.
- Graves W., B. Williams and C. Thomsen. 1996. Berseem clover, winter annual forage for California agriculture. DANR Publisher, USA. pp. 15-22.
- Lalie R.C. Rakoccivic and R.Ristic. 1999. Effect of sowing dates on the yield and quality of berseem in Agric. Ecological condition of Icosovoc Savermena Poljopriureda. 29(3-4): 173-193.
- Malik A., Fayyaz-ul Hassan, W. Abdul, Q. Ghulam and A. Rehman. 2006. Interactive effect of irrigation and Phosphorus on green gram. *Pak. J. Bot.* 38(4): 1119-1126.
- Mukharjee A. K. and S.R. Mandal. 2000. Effect of dates of sowing, cutting management and levels of P application on seed yield of shaftal and berseem. *Enviro. and Econ.* 18(2): 506-508.
- Narwal S. S. and V. Sardans. 2000. Effect of sowing dates and seed rates on the green forage, seed yield and quality of late sown berseem and shaftal. *J. Maharashtra Agric. Univ.* 25(2): 181-184.
- Shah M.S., Z.A. Khan and Y. Kalim. 1993. Elements concentration of soil and other surfacial material of the conterminous. M. Phill Thesis. Chem. Univ. of Peshawar, Pakistan.
- Virendra S. D., S. Narwal and V. Sardana. 1999. Effect of cutting dates on forage and seed quality of berseem sown on different dates. *Indian J. Pl. Physio.* 4(2): 133-136.
- Virendra S. S., S. Narwal and V. Sardana. 2000. Influence of time of sowing and last cut for fodder and seed yield of Egyptian clover. *J. Agric. Sci.* 3(134): 285-291.