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Effect of different sowing dates on growth and yield of berseem (*Trifolium alexandrinum* L.)

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Abstract
The results revealed growth as well as fodder and seed yield traits of berseem were significantly influenced by planting dates ($P<0.05$). On the basis of overall growth and yield performance, the berseem sown on 30th October ranked 1st producing 82.13 cm plant height, 99.66 leaves plant^{-1}, 26.17 branches^{-1}, 18.83 g fodder weight plant^{-1}, 34167 kg green fodder yield ha^{-1}, 4720.0 kg dry fodder yield ha^{-1} and 916.67 kg seed yield ha^{-1}. The berseem sown on 15th October ranked 2nd with 74.16 cm plant height, 93.33 leaves plant^{-1}, 22.50 branches^{-1}, 17.00 g fodder weight plant^{-1}, 32333 kg green fodder yield ha^{-1}, 4220 kg dry fodder yield ha^{-1} and 861.67 kg seed yield ha^{-1}. Similarly, sowing of berseem on 30th September ranked 3rd with 65.33 cm plant height, 89.83 leaves plant^{-1}, 17.83 branches^{-1}, 12.50 g fodder weight plant^{-1}, 24333 kg green fodder yield ha^{-1}, 3156 kg dry fodder yield ha^{-1} and 660 kg seed yield ha^{-1}. Delayed sown berseem on 15th November ranked 4th with 59.33 cm plant height, 72.33 leaves plant^{-1}, 18.00 branches^{-1}, 8.83 g fodder weight plant^{-1}, 22000 kg green fodder yield ha^{-1}, 2820 kg dry fodder yield ha^{-1} and 595 kg seed yield ha^{-1}. However, least performance was recorded when the crop was cultivated on 30th November with 54.50 cm plant height, 69.50 leaves plant^{-1}, 13.33 branches^{-1}, 7.00 g fodder weight plant^{-1}, 16000 kg green fodder yield ha^{-1}, 2820 kg dry fodder yield ha^{-1} and 395 kg seed yield ha^{-1}. Hence, 15th to 30th October could the best time of sowing for Egyptian variety of berseem under agro-ecological conditions of Tandojam.

Keywords: berseem, effect, different sowing dates, growth, yield

1. Introduction
Berseem (Egyptian clover), *Trifolium alexandrinum* (L.) an annual leguminous fodder crop is a member of Leguminosae family, capable of supplying green fodder during winter months by four to five consecutive cuttings. It is a crop of irrigated area and possesses vast yield potential. It is generally believed among scientists that berseem is originated in the Mediterranean region [1]. and berseems has the advantage of multiple harvests and during a growing season of 4-5 months (depend on day temperature), the farmers can achieve 8-10 harvests if soil is optimally enriched with the required nutrients. Apart from fresh fodder, berseem hay is favorable off-season feed of the animals. However, the quality of hay is associated with the maturity stage of the crop as the chemical composition of the produce may vary stage of maturity and accordingly the digestibility may be affected and this is associated with the plant nutritive value. When calculated as feed, the chemical composition of later berseem harvests may be higher than the early harvests, but the digestibility of later harvests is poor due to lower digestible protein as compared to earlier harvests on dry matter basis basis [2].

Berseem is also known as Egyptian clover and there are indications of its cultivation as a major winter crop for animal fodder in the ancient Egyptian civilizations. In Sindh (Pakistan), the cultivation of Egyptian clover has been introduced from Egypt in the twentieth century, where its adaptability to the conditions and systems of the farming was well proved in the irrigated tracts. When the crop cultivation well adopted in Sindh region before establishment of Pakistan, the Egyptian clover cultivation spread as fodder crop throughout the northern parts of British India [3]. Now, the Egyptian clover has become the major Rabi fodder crop and millions of hectares are under its cultivation in the region. Its speedy adaptability was more associated probably with its most rapid spreading habit and mainly because of cultivation under smallholder conditions. The Egyptian clover is also successfully cultivated in the United States as winter; and as summer crop in southern parts of the Europe [4]. Among winter forage legumes, Egyptian clover occupies a prominent place in farm economy. Due to extra ordinary growth characters, it gives several cuttings during its growing season, being palatable and readily digestible, to all the animals. Its dry matter content includes 18.3 percent protein, 2.8 percent phosphorus, 2.6 percent calcium and also is rich in vitamin A. In addition, it enriches the soil by fixing considerable quantity of atmospheric nitrogen. Its vigorous root system improves water holding capacity and organic matter of soil and different varieties of Egyptian clover showed different response for fodder and seed production [5]. In Pakistan, Egyptian clover crop thrives best in its central and southern parts since most Egyptian clover varieties under cultivation are winter hardy, tolerant to alkalinity. The high yields can be achieved if sowing is completed up to 15th November and early sowing in September may not be beneficial and the may be started from

the last of September and can be continued up to 15th November by broadcasting method at the sowing rate of 25 kg ha^{-1}. Honey bees are the pollinators; while crown rot disease could be a problem when forage accumulation is high. The sowing rates of Egyptian clover may vary with the soil condition; but about 8 kg per acre would be enough when Egyptian clovers sown with grass mixtures of cool-season. The soil pH must be over 6 because Egyptian clover tolerates acidity to a considerable extent; it phosphorus, potash and boron fertilizers in high quantities [6]. The remaining essential nutrients, derived from the soil are referred to as micronutrients, because they are needed in small amounts; which mainly included zinc, boron, copper, iron and manganese [7]. Nitrogen, phosphorous and Potassium play a vital role in crop growth and development [8, 9]. Information on the nutritive value of Egyptian clover is limited [10] and nutrient values of corn residues are similar to those of alfalfa hay. There is need to conduct systematic work in Sindh province on the factors limiting growth and fodder yield of Egyptian clover.

Optimum sowing time of Egyptian clover in Pakistan varies according to the region ecology and in Sindh province this leguminous valuable fodder is cultivated generally in October; but its cultivation should be started from the last week of September and completed before 15th November. Sowing on early dates may produce high yields and more harvests than that sown later. In northern areas of Pakistan Egyptian clover is optimally sown in November and November sowing produces maximum production, because in these areas winter prolongs; while in southern parts winter season is relatively short. As the temperature crosses 30ºC its production starts decreasing [3]. The delayed sowing from October 1st to November 15th caused a decrease in yield of fresh and dry forage, but increase in seed yield was recorded [11]. Number of harvests is the major factor that influences the forage and seed yields [12]. For achieving higher fresh forage and seed yield optimum sowing time is of primary importance [13]. In different areas of Punjab province and Khyber Pakhtoonkhwa, sowing period of Egyptian clover is September last week up to 2nd week of October. However, farmers generally delay sowing of Egyptian clover due to their engagements in other field activities related to cultivation of summer crops [14]. Feeling the importance of sowing time in production of Egyptian clover fodder, the present study was conducted to investigate the effect of different sowing dates on growth and yield of Egyptian clover under agro-ecological conditions of Tandojam.

2. Materials and methods

The studies were performed during the year 2015-16 to investigate the effect of different sowing dates on growth and yield of Egyptian clover under Tandojam conditions. The trial was conducted at Students' Experimental Farm, Agronomy Department, SAU Tandojam located at 25º25' 60'N 68o31' 60E 19.5 m asl. The land was prepared by giving two dry plowings followed by precision land leveling. Flat beds were developed and after soaking dose the Egyptian clover seed was broadcasted in standing water.

Common cultivated Egyptian clover variety "Egyptian" was planted at five different dates and planting dates were considered as the treatments of the study. The experiment was replicated three times for each treatment. A Randomized Complete Block Design (RCBD) was used for this study. The total area used for this experiment was 180m^2 excluding the area under bunds and feeding channels. There were 15 sub-plots in three replicates, five treatments in each replicate and the sub-plot size used in the experiment was 3 m × 4 m = (12 m^2).

The planting was done through broadcast method at the seeding rate of 25 kg ha^{-1}. The details of the five treatments based on the sowing time of Egyptian clover are given as follows:

2.1 Sowing dates = 05

S_1 = 30st September
S_2 = 15th October Recommended (Agro Digest, ARI, 2012)
S_3 = 30th October
S_4 = 15th November
S_5 = 30th November

The nitrogen (100 kg ha^{-1}) and phosphorous (80 ha^{-1}) were applied in the form of Urea and D.A.P., respectively; while the potash (60 kg ha^{-1}) was applied in the form of M.O.P. (Muriate of Potash). All phosphorous and Potash in addition to half of the nitrogen was applied at the time of seedbed preparation and remaining N was divided into two equal splits and applied at monthly interval.

Initially, weekly irrigation was applied, but later interval between irrigations was managed according to the crop requirement. The first harvest of the green forage was achieved after 35 days of sowing and later at 21 days interval using sickle. The whole harvested material (Egyptian clover forage) after each harvest was kept in bundles and shifted to weighing yard. The observations were recorded in all treatments for the following parameters:

2.2 Observations recorded

1. Plant height (cm)
2. Number of leaves plant^{-1}
3. Number of branches plant^{-1}
4. Fodder weight (g) plant^{-1}
5. Green fodder yield (kg ha^{-1})
6. Dry fodder yield (kg ha^{-1})
7. Seed yield (kg ha^{-1})

2.3 Methods of taking observations

2.3.1 Plant height (cm)

The plant height at each cutting was recorded on the basis of randomly selected five plants treatment^{-1} from the bottom to the top of plant with the help of measuring tape.

2.3.2 Leaves plant^{-1}

Number of leaves plant^{-1} was recorded from five randomly selected plants in each treatment.

2.3.3 Branches plant^{-1}

Number of branches of each cutting was recorded on the basis of randomly selected five plants per plot.

2.3.4 Green fodder weight plant^{-1} (g)

The green fodder weight plant^{-1} was recorded on the basis of

green fodder weight in one square meter area and then calculated on the basis of total number of plants in one square meter area.

2.3.5 Green fodder yield (kg ha^{-1})
The green fodder was observed on the basis of fodder weight obtained from one meter square area and the sum was converted to green fodder yield plot^{-1}. The fodder yield achieved from a plot of certain size was converted to green fodder yield ha^{-1} using factor of one meter square.

2.3.6 Dry fodder yield (kg ha^{-1})
The green fodder achieved from each plot for each harvest was kept in the yard for drying under sun for one week and after ensuring the drying of produce same method was used for weighing and subsequent calculation used for green fodder yield ha^{-1}.

2.3.7 Seed yield (kg ha^{-1})
The last harvest was kept for seed production and after maturity the biomass of each plot was kept in the drying yard under sun for one week and threshing was operated to separate seed from the dried foliage. The seed achieved from each plot was calculated following the same method employed in calculation of green fodder yield ha^{-1}.

2.3.8 Statistical Analysis
The data thus collected were subjected to statistical analysis to assess significance of treatment means and L.S.D. test was used to compare the treatment groups as suggested by [15].

3. Layout plan of experiment
3.1 Experimental design: Randomized Complete Block Design (RCBD)

3.2 Replications = Three

3.3 Net plot size = 3 m × 4 m = (12 m^2)

3.4 Variety = Egyptian

3.5 Sowing dates = 05
S_1 = 30st September
S_2 = 15th October Recommended (Agro Digest, ARI, 2012)
S_3 = 30th October
S_4 = 15th November
S_5 = 30th November

T_1	Feeding channel	T_5	Feeding channel	T_4
T_2		T_4		T_5
T_3		T_2		T_1
T_4		T_3		T_2
T_5		T_1		T_3
Main Water Channel				

4. Results and discussion
In order to investigate the sowing time effects on growth and yield of Egyptian clover variety 'Egyptian' the study was carried out during the year 2015-2016. The treatments comprised of five sowing dates and the sowing of crop was done on September 30th 2015, October 15th, 2015 [Recommended] (Agro Digest, ARI, 2012), October 30th 2015, November 15th 2015 and November 30th 2015. The experimental crop was monitored for height of plant, leaves number per plant, branches number per plant, green fodder weight per plant^{-1}, green fodder yield ha^{-1}, dry fodder yield ha^{-1} and seed yield ha^{-1}. The statistically analyzed mean results (Tables 1-7) are interpreted in the result.

4.1 Plant height (cm)
The effect of different sowing dates on the plant height of Egyptian clover was examined and the results are presented in Table 1. The results depicted that the Egyptian clover crop produced plants greater in height (82.13 cm) when planting was done on October 30th 2015; followed by height of plant in Egyptian clover planted on October 15th 2015 and September 30th 2015 with average plant height of 74.16 cm and 65.33 cm, respectively. Delayed planting of Egyptian clover on November 15th 2015 resulted in a considerable adverse impact on this parameter, where the average plant height was 59.33 cm; while the lowest plant height of 54.50 cm was monitored in plots planted on November 30th 2015.
The Egyptian clover showed maximum growth performance up to October 30th, 2015 planting; and plant height decreased gradually with each fortnight delay in the planting. It was further observed that Egyptian clover planting during the month of October proved to be most effective for plant growth; while early planting in month of September as well as delayed planting in the month of November was not beneficial for plant height trait.
The LSD test showed that the differences in plant height among all the planting dates was significant ($P<0.05$). Hence, it is suggestible that for achieving better Egyptian clover growth, the crop may be planted during the month of October.

4.2 Leaves per plant
The effect of different dates of sowing on the leaves number per plant of Egyptian clover was evaluated and the results are presented in Table 2. The results exhibited that the Egyptian clover crop produced plants with maximum leaves per plant (99.66) when sowing of the crop was done on October 30th 2015; followed by 93.33 leaves number per plant recorded in case of the crop planted on October 15th 2015 (recommended sowing date) and September 30th 2015 with 89.83 average leaves number per plant. Egyptian clover planted delayed on November 15th 2015 resulted in a considerable negative effect on leaves number of plant, where the average leaves number was 72.33; while the minimum leaves number per plant of 69.50 was recorded in plots sown most delayed on November 30th 2015.
The results showed that the Egyptian clover plants had maximum leaves bearing when seed sowing was done on October 30th, 2015; and leaves number per plant reduced regularly with each fortnight delay in sowing. It was further indicated that Egyptian clover sowing during the month of October proved to be most effective for plant growth when maximum leaves were developed on plants; while early planting in month of September as well as delayed planting in

the month of November did not prove beneficial for the trait leaves number per plant. Moreover, results also indicated that the crop sown on 30th October produced better foliage than the recommended sowing date of 15th October which indicates atmospheric change and consequent change in the suitable sowing date of berseem.

The LSD test indicated that the differences in leaves number per plant at different sowing dates in the month of November or between 30th September and 15th October sowing dates were statistically non-significant (P>0.05) and significant (P<0.05) when these treatment groups were compared with each other. Hence, it is concluded that for high foliage in Egyptian clover, the crop may be sown in October.

4.3 Branches plant^{-1}

The effect of varying sowing dates on branches number per plant of Egyptian clover was evaluated and the results (Table 3) exhibited that the Egyptian clover crop produced plants with relatively more branches per plant (26.17) when sowing was done on October 30th 2015; while the branching was adversely affected and it was 22.50 branches per plant in case of the crop sown on October 15th 2015 (recommended sowing date); while November 15th 2015 sowing and the crop sown on 30th September resulted in 18.00 and 17.83 average branches number per plant, respectively. The sowing of Egyptian clover delayed up to November 30th 2015 resulted in a minimum branches number of plant (13.33). This indicates that the performance of Egyptian clover in relation to branching was significantly better when sowing was delayed by 15 days up to 30th October 2015 over the recommended sowing date of 15th October.

It is evident from the results that Egyptian clover showed high bearing of branches when sowing was done on October 30th, 2015; and branching capacity decreased constantly with each fortnight delay; or fortnight earliness in sowing over October 30th sowing date. It was further noted that Egyptian clover sowing during the later fortnight of October month proved to be most effective for branching capacity; while early planting in month of September as well as delayed planting in the month of November described negative effect on this trait. It was concluded that for achieving maximum branching and foliage in Egyptian clover, the sowing in the month of October is more beneficial as compared to earliness or delay over30th October sowing.

4.4 Weight of fodder per plant

The effect of different dates of sowing on the Egyptian clover weight of fodder per plant was examined and the data are given in Table 4. The results indicated that the crop produced maximum weight of fodder per plant (18.83 g) when sowing was done on October 30th 2015; followed by 17.00 g weight of fodder per plant recorded in case of the crop planted on October 15th 2015 (recommended sowing date); while September 30th 2015 sowing of Egyptian clover showed decreased weight of fodder per plant (12.50 g). The crop sown later on November 15th 2015 performed poor in relation to weight of fodder per plant (8.83 g); and the lowest weight of fodder per plant (7.00 g) was recorded in plots sown on November 30th 2015.

The Egyptian clover had averagely highest fodder weight per plant when sowing was done on October 30th, 2015; and weight of fodder per plant reduced significantly with each delay over 30th October sowing or sowing prior to this date. The results further showed that Egyptian clover sowing during the month of October resulted in high performance in sense of fodder weight per plant which is against the recommendation of Agriculture Department (Agro Digest, ARI, 2012), according to the recommendation 15th October was an optimum sowing date of Egyptian clover; while in this study has proved that 30th October is the optimum sowing date of Egyptian clover as suggested by the crop performance for this trait.

The LSD test demonstrated that the differences in weight of fodder per plant at different sowing dates was linear and significant (P<0.05) suggesting that for higher Egyptian clover fodder yields, the crop may be sown in the last of week of October.

4.5 Green fodder yield (kg ha^{-1})

The green fodder yield response of Egyptian clover to varying sowing dates was ascertained and the data (Table 5) revealed that the Egyptian clover produced highest green fodder yield (34167 kg ha^{-1}) when sowing was done on October 30th 2015; while the green fodder yield reduced to 32333 kg ha^{-1} when the crop sowing was done on October 15th 2015 (recommended sowing date). The results further showed that September 30th 2015 sowing produced green fodder yield of 24333 kg ha^{-1}; while delayed sowing of 15th November 2015 resulted in reduced green fodder yield of 22000 kg ha^{-1}. However, the lowest green fodder yield of 16000 kg ha^{-1} was recorded in crop sown on 30th November. This indicates that the performance of Egyptian clover in relation to green fodder yield per hectare was significantly better when sowing was delayed by 15 days up to 30th October 2015 over the recommended sowing date of 15th October.

The results show a change in ecosystem because the general recommendation in relation to sowing date of Egyptian clover (15th October) did not prove promising for green fodder yield; and 15 days later sowing on 30th October produced a remarkable high crop yield over the recommended date of sowing. Moreover, sowing of Egyptian clover in September was also uneconomical; while sowing in November was also not beneficial so far the green fodder yield per hectare is concerned. In view of the findings regarding green fodder yield, it was concluded that Egyptian clover sowing must not be delayed beyond 30th October and earliness in sowing in September may also be avoided.

The LSD test showed that the differences in green fodder yield per hectare of Egyptian clover between 15th October and 30th October or between 30th September and 15th November was statistically non-significant (P<0.05) and significant when these treatment groups were compared with each other.

4.6 Dry fodder yield (kg ha^{-1})

The dry fodder yield in response to sowing dates was examined and the data (Table 6) disclose that the crop produced highest dry fodder yield (4720.0 kg ha^{-1}) when sowing was done on October 30th 2015; while the dry fodder yield reduced to 4220 kg ha^{-1} when the sowing was done on

October 15th 2015 (recommended sowing date). The September 30th 2015 sowing produced dry fodder yield of 3156 kg ha^{-1}; while delayed sowing of 15th November 2015 resulted in reduced dry fodder yield of 3063 kg ha^{-1}. However, the lowest dry fodder yield of 2820 kg ha^{-1} was recorded in crop sown on 30th November. This suggests that the performance of Egyptian clover in relation to dry fodder yield per hectare was significantly higher when sowing was done on 30th October 2015 as compared to recommended sowing date of 15th October.

The dry fodder yield trend clearly indicates a quality produce received from the crop sown on 30th October which was remarkably higher than the dry fodder yield achieved on the recommended sowing date of 15th October. There may be an environmental change in this region as reflected from the better crop performance from 30th October sowing instead of recommended sowing date of 15th October. Moreover, early sowing of September or delayed sowing of November did show beneficial crop performance.

The LSD test indicated that the differences in dry fodder yield per hectare between all the sowing dates were linearly significant ($P<0.05$). Hence, for achieving a quality crop harvest of Egyptian clover sowing may be done in the last week of October.

4.7 Seed yield (kg ha^{-1})

The results in regards to seed yield in response to sowing dates (Table 7) indicated that the crop sown on 30th October 2015 produced highest seed yield per hectare (916.67 kg); while the seed yield showed a decline (861.67 kg ha^{-1}) when the sowing was done on October 15th 2015 (recommended sowing date). The seed yield further decreased to 660.00 kg and 595.00 kg ha^{-1} when the sowing of crop was done on September 30th 2015 and November 15th 2015, respectively. However, the crop sown on 30th November 2015 produced lowest seed yield of 395.00 kg ha^{-1}. The behaviour of the data obtained from the present research showed guides that 30th October 2015 sowing produced greater seed yield than the crop sown on 15th October (recommended sowing date). The situation leads to say that climate is in change and suitable environment for Egyptian clover sowing is last week of October insteadof earlier recommendation for second week of October.

The results of the study showed that the crop sown on 30th October produced high seed production performance than the crop sown earlier or later to 30th October sowing. However, 15th October sowing of Egyptian clover which was recommended by the Agriculture Department as an optimum sowing date did not prove its validity as an optimum sowing time.

The LSD test showed that the differences in seed yield per hectare among all the sowing dates were linear and significant ($P<0.05$). Hence, for achieving higher crop harvest for seed production purpose, the Egyptian clover sowing may be done in the last week of October.

Egyptian clover (Berseem), botanically named as *Trifolium alexandrinum* L. is leguminous grass that is liked by all ruminants; and produces multiple harvests [2]. Since great attention should be paid towards improving fodder yield, keeping quality and maturation time. One of the important lines of research towards this improvement is to study the effect of planting dates on the growth, fodder yield and seed yield. Planting dates means the effect of environmental conditions in large scale on growth, fodder yield and seed yield, which differ widely from region to another. The study was carried out to investigate the effect of different sowing dates on the fodder yield, its associated traits and seed yield of Egyptian clover under agro-ecological conditions of Tandojam.

The results regarding plant height showed that the Egyptian clover produced plants greater in height (82.13 cm) when planting was done on October 30th 2015; followed by height of plant in Egyptian clover planted on October 15th 2015 (recommended sowing date) with average plant height of 74.16 cm. The Egyptian clover showed maximum growth performance up to October 30th, 2015 planting; and plant height decreased gradually with each fortnight delay in the planting. It was further observed that Egyptian clover planting during the month of October proved to be most effective for plant growth; while early planting in month of September as well as delayed planting in the month of November was not beneficial for plant height trait. These results are further supported by those of [16] who reported that delayed sowing resulted in shorter plants in Lucerne, shaftal and Egyptian clover [17]. Reported that plant height was a major factor to influence the fodder yield in Egyptian clover.

Leaves per plant findings showed that the crop produced plants with maximum leaves per plant (99.66) when sowing of the crop was done on October 30th 2015; followed by 93.33 leaves number per plant recorded in case of the crop planted on October 15th 2015 (recommended sowing date) with 89.83 leaves per plant. The Egyptian clover plants had maximum leaves bearing when seed sowing was done on October 30th, 2015; and leaves number per plant reduced regularly with each fortnight delay in sowing. It was further indicated that Egyptian clover sowing during the month of October proved to be most effective for plant growth when maximum leaves were developed on plants; while early planting in month of September as well as delayed planting in the month of November did not prove beneficial for the trait leaves number per plant. Moreover, results also indicated that the crop sown on 30th October produced better foliage than the recommended sowing date of 15th October which indicates atmospheric change and consequent change in the suitable sowing date of berseem. Similar results have also been reported by [18] who found that Egyptian clover sowing delayed from October 1st to November 15th caused significant decrease in crop foliage; while [19] reported that the crop sown on October 1st or October 15th sowings produced high crop biomass than the delayed sown crop.

Branches plant^{-1} data showed that the crop produced plants with relatively more branches per plant (26.17) when sowing was done on October 30th 2015; while the branching was adversely affected and it was 22.50 branches per plant in case of the crop sown on October 15th 2015. High bearing of branches was recorded when sowing was done on October 30th, 2015; and branching capacity decreased constantly with each fortnight delay; or fortnight earliness in sowing over October 30th sowing date. It was further noted that Egyptian clover sowing during the later fortnight of October month

proved to be most effective for branching capacity; while early planting in month of September as well as delayed planting in the month of November described negative effect on this trait. It was concluded that for achieving maximum branching andfoliage in Egyptian clover, the sowing in the month of October is more beneficial as compared to earliness or delay over 30th October sowing. The results of the present study regarding branches per plant were in accordance with the [20] who reported that the highest yields in Egyptian clover were achieved from the crop sown on 11th November and the yield was associated with branching capacity; while [21] concluded that mid-October to late October sowing of shaftal resulted in higher green forage yield in both the crops. However, plant height and branches per plant were the major factor to influence forage yields.

Weight of fodder per plant results showed that the crop produced maximum weight of fodder per plant (18.83 g) when sowing was done on October 30th 2015; followed by 17.00 g weight of fodder per plant recorded in case of the crop planted on October 15th 2015. The highest fodder weight per plant when sowing was done on October 30th, 2015; and weight of fodder per plant reduced significantly with each delay over 30th October sowing or sowing prior to this date. The results further showed that Egyptian clover sowing during the month of October resulted in high performance in sense of fodder weight per plant which is against the recommendation of Agriculture Department (Agro Digest, ARI, 2012), according to the recommendation 15th October was an optimum sowing date of Egyptian clover; while in this study has proved that 30th October is the optimum sowing date of Egyptian clover as suggested by the crop performance for this trait [18]. Reported that mid-season sowing of Egyptian clover resulted in higher fodder weight as compared delay in sowing and early planting of the fodder [22]. Reported that optimum sowing time may vary with the change in climate.

Green fodder yield data indicated that the green fodder yield was highest (34167 kg ha^{-1}) when sowing was done on October 30th 2015; while the green fodder yield reduced to 32333 kg ha^{-1} when the crop sowing was done on October 15th 2015 (recommended sowing date). The 15th October sowing did not prove promising for green fodder yield; and 15 days later sowing on 30th October produced a remarkable high crop yield over the recommended date of sowing. Moreover, sowing of Egyptian clover in September was also uneconomical; while sowing in November was also not beneficial so far the green fodder yield per hectare is concerned. In view of the findings regarding green fodder yield, it was concluded that Egyptian clover sowing must not be delayed beyond 30th October and earliness in sowing in September may also be avoided. These results are in line with those of [23] who examined the effect of sowing time on green fodder production in Egyptian clover in Peshawar valley and highest fresh forage production (17233 kg ha^{-1}), dry fodder yield (12916 kg ha^{-1}) was realized when the crop was cultivated on 15th November [22]. reported that the highest yield of fresh forage (17233 kg ha^{-1}), yield of dry fodder 20 days after first harvest (12916 kg ha^{-1}), number of days taken to 75 percent flowering (173) were recorded from November 15th sowing. The results concluded that Egyptian clover sowing either on November 15th or December 15th showed better performance in relation to fodder production and for agro-ecological conditions of Peshawar this date of sowing produced maximum fodder yields [24]. Concluded that all the growth and yield traits of Shaftal and Egyptian clover were recorded when the crop was cultivated on 1st November. The line sowing proved to be more effective to produce green forage yields higher than that under broadcasting method. The results on dry fodder yield indicated that the dry fodder yield in response to sowing dates was highest (4720.0 kg ha^{-1}) when sown on October 30th 2015; while the dry fodder yield reduced to 4220 kg ha^{-1} when the sowing was done on October 15th 2015. The dry fodder yield trend clearly indicates a quality produce received from the crop sown on 30th October which was remarkably higher than the dry fodder yield achieved on the recommended sowing date of 15th October. There may be an environmental change in this region as reflected from the better crop performance from 30th October sowing instead of recommended sowing date of 15th October. Moreover, early sowing of September or delayed sowing of November did show beneficial crop performance. The results of the study are in accordance with those of [23] who examined the effect of sowing time on green fodder production in Egyptian clover in Peshawar valley. The treatment included several dates of sowing such as: 15th November 15th, December 15th, January 15th and February 15th. The highest dry fodder yield (12916 kg ha^{-1}) was realized when the crop was cultivatedon 15th November [22]. Found that yield of dry fodder 20 days after first harvest was highest from November 15th sowing. The findings on seed yield ha^{-1} showed that the crop sown on 30th October 2015 produced highest seed yield per hectare (916.67 kg); while the seed yield showed a decline (861.67 kg ha^{-1}) when the sowing was done on October 15th 2015. The results of the study showed that the crop sown on 30th October produced high seed production performance than the crop sown earlier or later to 30th October sowing. However, 15th October sowing of Egyptian clover which was recommended by the Agriculture Department as an optimum sowing date did not prove its validity as an optimum sowing time. Similar results have also been reported by [25] who indicated that delayed sowing by fifteen days from November 1st to December 1st greatly decreased seed yield, and seed yield was relatively higher when the crop was cultivated on November 15th. [26] Reported that Egyptian clover sowing in lines showed maximum seed yield (198 kg ha^{-1}) [27]. showed that the highest seed emergence and height of the plant, fresh and dry forage yield were achieved when the crop was cultivated on November 1st. [28] found highest seed yield (653kgha^{-1}) when the crop was cultivated on November 15th.

5. Tables

Table 1: Plant height (cm) of berseem (*Trifolium alexandrinum* L.) as influenced by different dates of sowing

Treatments	Mean plant height (cm)
S_1=30th September	65.33^{C}
S_2=15th October Recommended (Agro Digest, ARI, 2012)	74.16^{B}
S_3=30th October	82.13^{A}
S_4=15th November	59.33^{D}

S_5=30th November	54.50^E

S.E.± = 0.6473 LSD 0.05 = 1.4923 CV% = 1.18

Table 2: Number of leaves plant^{-1} of berseem (*Trifolium alexandrinum* L.) as influenced by different dates of sowing

Treatments	Mean number of leaves plant^{-1}
S_1=30th September	89.83^B
S_2=15th October Recommended (Agro Digest, ARI, 2012)	93.33^B
S_3=30th October	99.66^A
S_4=15th November	72.33^C
S_5=30th November	69.50^C

S.E.± = 1.6566 LSD 0.05 = 3.8202 CV% = 2.39

Table 3: Number of branches plant^{-1} of berseem (*Trifolium alexandrinum* L.) as influenced by different dates of sowing

Treatments	Mean number of branches plant^{-1}
S_1=30th September	17.83^{AB}
S_2=15th October Recommended (Agro Digest, ARI, 2012)	22.50^{AB}
S_3=30th October	26.17^A
S_4=15th November	18.00^{AB}
S_5=30th November	13.33^B

S.E.± = 4.1177 LSD 0.05 = 9.4955 CV% = 25.77

Table 4: Fodder weight (g) plant^{-1} of berseem (*Trifolium alexandrinum* L.) as influenced by different dates of sowing

Treatments	Mean fodder weight (g) plant^{-1}
S_1=30th September	12.50^C
S_2=15th October Recommended (Agro Digest, ARI, 2012)	17.00^B
S_3=30th October	18.83^A
S_4=15th November	8.83^D
S_5=30th November	7.00^E

S.E.± = 0.6325 LSD 0.05 = 1.4584 CV% = 6.04

Table 5: Green fodder yield (kg ha^{-1}) of berseem (*Trifolium alexandrinum* L.) as influenced by different dates of sowing

Treatments	Mean green fodder yield (kg ha^{-1})
S_1=30th September	24333^B
S_2=15th October Recommended (Agro Digest, ARI, 2012)	32333^A
S_3=30th October	34167^A
S_4=15th November	22000^B
S_5=30th November	16000^C

S.E.± = 1098.0 LSD 0.05 = 2531.9 CV% = 5.22

Table 6: Dry fodder yield (kg ha^{-1}) of berseem (*Trifolium alexandrinum* L.) as influenced by different dates of sowing

Treatments	Mean dry fodder yield (kg ha^{-1})
S_1=30th September	3156.7^D
S_2=15th October Recommended (Agro Digest, ARI, 2012)	4220.0^B
S_3=30th October	4720.0^A
S_4=15th November	3063.3^D
S_5=30th November	2820.0^E

S.E.± = 32.215 LSD 0.05 = 74.287 CV% = 1.10

Table 7: Seed yield (kg ha^{-1}) of berseem (*Trifolium alexandrinum* L.) as influenced by different dates of sowing

Treatments	Mean seed yield (kg ha^{-1})
S_1=30th September	660.00^C
S_2=15th October Recommended (Agro Digest, ARI, 2012)	861.67^B
S_3=30th October	916.67^A
S_4=15th November	595.00^D
S_5=30th November	395.00^E

S.E.± = 15.916 LSD 0.05 = 36.703 CV% = 2.84

6. Conclusions

It was concluded that 30th October was an optimum sowing date for Egyptian variety of berseem; sowing earlier on 15th October showed a little adverse effect on the crop performance, but earliest sowing on 30th September did not prove beneficial with poor crop performance. Moreover, sowing delayed beyond 30th October showed severe adverse effects on growth, fodder yield as well as seed yield of berseem. Hence, 15th to 30th October could the best time of sowing for Egyptian variety of berseem under agro-ecological conditions of Tandojam.

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