
ORIGINAL ARTICLE

Seed quality influenced by dates of Bulb Planting and application of foliar nutrition on onion cv. Arka Kalyan

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ABSTRACT

In present year, demand of onion in domestic and international market is increasing day by day but non-availability of good quality seed is limitation for profitable seed production programme of onion. Hence an experiment was conducted to study the effect of dates of bulb planting and application of foliar nutrition on plant growth and seed yield of onion during the Rabi season 2015-16 and 2016-17. The experiment consisted of five dates of bulb planting with four application of foliar nutrition. The experiment was laid out in Randomized Complete Block Design (RCBD) with two factorial concepts. The experimental results revealed the significant effect of dates of bulb planting and application of foliar nutrition on seed quality. Significantly highest values were recorded in the seed quality parameters like thousand seed weight (5.50 g), seed germination (98.33 %), coefficient velocity of germination (0.75), speed of germination (46.19), seedling vigour index-I (1,975), seedling vigour index-II (2,559), field emergence (93.58 %) and lowest electrical conductivity (0.640 dS/m) were recorded by planting the bulbs on November-1st coupled with application of multi micronutrient mixture at 0.25 per cent (D₃T₃) and significantly the lowest was recorded by December-1st planting with without spray (D₅T₄).

Keywords: Bulb Planting, RCBD, Seed Germination, Seed Vigour Index

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INTRODUCTION

Onion (*Allium cepa L.*) is one of the major spice bulb crops of the world and India. It has great economic importance due to its medicinal and dietetic values. Onion is a biennial crop. It completes vegetative phase with bulb production in the first year. The bulbs are used as planting material for production of true seed in the second year. The demands of quality true seeds are increasing day by day and the price of quality seeds is also high. Onion is a thermo and photosensitive crop; the seeds are produced during winter period (Rabi season). Foggy weather at early stage of crop growth and early rain at the flowering stage adversely affect the seed crop. Thus, the time of planting of bulbs for true seed production in a particular location needs to be determined for quality seed production of onion [1]. Planting date may vary in different localities as well as agro ecological zones and even from year to year at the same place due to climate change. The environmental conditions greatly influence the growth and development of onion plant. Different growth phases of onion have varied environmental requirements. Besides time of bulb planting, plant nutrition also influences the crop growth, seed yield and quality. The application of foliar nutrition is the quickest way to deliver nutrients to the tissues and organs of the crop, and is proved that application of these micronutrients beneficial to correct the certain nutrient deficiencies. Keeping all these above facts in view, the present investigation "effect of planting dates and foliar application of nutrition on seed yield and quality of onion," was undertaken.

MATERIALS AND METHODS

The field experiment was conducted by using foundation seeds Cv. Arka kalyana obtained from Seed unit, UAS, Dharwad at 'H' block, seed unit, University of Agricultural Sciences, Dharwad, during rabi -2016-17

to study the effect of five dates of bulb planting viz., **D₁**:October-1st, **D₂**:October-15th, **D₃**:November-1st, **D₄**:November-15th and **D₅**:December-1st and four types of application of foliar nutrition viz., **T₁**:Borax @ 0.25 %, **T₂**:Potassium nitrate @ 0.5 %, **T₃**:Micronutrient mixture @ 0.25 % and **T₄**:Control. The experiment was laid out in Randomized Complete Block Design (RCBD) with two factorial concepts.

RESULTS AND DISCUSSION

Effect of planting time on seed quality attributes

Irrespective of foliar nutrition application, planting bulbs on November 1st recorded significant differences for all seed quality parameters (Table 1 to 4). The pooled analysis of 2015-16 & 2016-17 shown that the significantly higher seed germination percentage (96.29 %), coefficient of velocity of germination (0.71), speed of germination (42.83), seedling vigour index-I and II (1918 & 2308), field emergence (90.82 %) and lower electrical conductivity of seed leachate (0.642 dS/m) from result out seeds of planting November 1st planting compared to delayed bulb December 1st (**D₅**) (88.13, 0.49, 38.09, 1672, 1855, 85.38 and 0.667 dS/m, respectively). The 2015-16 and 2016-17 individual experiment also exhibited similar trend for seed quality parameters. In the present study, superior seed quality parameters noticed in seeds obtained from November bulb planting may be attributed to luxuriant growth of mother plant and better source to sink relationship proper pollination and fertilization and seed development resulted in highest seed germination and seedling vigour index due to better accumulation and assimilation of photosynthates into the sinks as reflected from the findings of the present study. Whereas, seeds harvested from bulb planted crop from December were of comparatively poor quality by registering the lowest seed germination and vigour index due to the stress conditions existed during growth, flowering and crop maturity periods. The similar superior trend in seed quality parameters was also confirmed by Muktadir [2], Uddin *et al.* [3] and Khan [4] who got higher seed yield (966 kg/ha) and germination (80 %) when bulb planting was done on 10th November.

Effect of foliar nutrition on seed quality

The effect of foliar spraying of plant nutrients was found significant for all the seed quality parameters studied in the pooled data and individual two year experiments (Table 1 to 4). The foliar application of 0.25 per cent multi micronutrients mixture during flower initiation and peak flowering stage recorded significantly maximum seed germination (94.20 %), coefficient of velocity of germination (0.66), seedling vigour index-I & II (1,865 and 2,195), and field emergence (90.22 %) with reduced electrical conductivity of seed leachates (0.648 d S/m), which was on par with borax at 0.25 per cent (93.17, 0.65, 40.53, 1826, 2,116, 22.58, 88.05 and 0.649, respectively) application as against significantly lowest value at control water spray (88.53, 0.59, 38.48, 1,696, 1,893, 21.29, 85.36 and 0.658, respectively). Similar results were obtained in both 2015-16 and 2016-17 experiment. The significantly better seed quality in terms of seed germination and seedling vigour index noticed in multi micronutrient may be related to the expression of better growth and reproductive parameters as seen in the present study. Further, it might also be attributed to the direct feeding of major nutrients (N (13 %) and K (46 %) in the form of complex water soluble fertilizer (potassium nitrate 0.5 per cent solution) and other nutrients to the plants that might have increased the photosynthesis and enzymatic activities leading to the efficient translocation and assimilation of photosynthetic from source (leaves) to sink (seeds) resulting in to the heavier and bolder seeds. Present results are in corroborative with the earlier findings of Brown *et al.* [5], Yallapa *et al.* [6] in cotton and Habib [7] in wheat. The foliar application of Zn and Mn increased seed quality parameters viz., germination, rate, germination per cent, seedling dry weight in safflower [8].

Interaction effect of dates of bulb planting and of foliar nutrient.

The interaction of dates of planting and foliar application of nutrition (D x T) revealed significant variations for all the seed quality parameters (Table 1 to 4). The **D₃T₃** treatment combination recorded consistently higher seed germination (98.33 %), coefficient of velocity of germination (0.75), seedling vigour index-I & II (1975 and 2,559), field emergence (93.58 %) with lower electrical conductivity (0.640 d S/m) of seed leachate which was on par with November 15th and 0.25 per cent Borax application interaction (**D₃T₁**) as compared to December 1st and control water spray (**D₅T₄**) interaction (85.17, 0.43, 20.56, 1,573, 1,758, 80.33 and more 0.692 d S/m respectively). The increased seed quality parameters ascribed to increased vegetative growth and thereby increased accumulation of photosynthates in the plant system, translocation and accumulation in the developing seeds. These results were also similar in both 2015-16 and 2016-17 individual experiments. These results are in agreement with earlier works of Vaganov and Sorokina [9] in cucumber.

Table 1: Effect of dates of bulb planting and application of foliar nutrition on test weight and germination in onion cv. Arka Kalyan

Treatment Planting time (D)	Test weight (g)			Germination (%)		
	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled
D ₁ : OCT-1 st	3.81	4.02	3.91	91.00	91.92	91.46
D ₂ : OCT-15 th	3.62	3.82	3.72	90.25	91.25	90.75
D ₃ : NOV-1 st	4.44	4.63	4.53	96.08	96.83	96.46
D ₄ : NOV-15 th	4.22	4.40	4.31	93.00	94.00	93.50
D ₅ : DEC-1 st	3.39	3.58	3.57	87.67	88.75	88.21
S.Em±	0.03	0.03	0.03	0.44	0.46	0.45
C.D. (P=0.05)	0.08	0.09	0.08	1.27	1.30	1.28
Application of foliar nutrition (T)						
T ₁ : Borax @ 0.25 %	3.93	4.14	4.03	92.67	93.67	93.17
T ₂ : Potassium nitrate @ 0.5 %	3.91	4.10	4.01	90.93	92.00	91.47
T ₃ : Micronutrient mixture @0.25%	4.00	4.18	4.09	94.40	95.20	94.80
T ₄ :Control	3.74	3.93	3.91	88.40	89.33	88.87
S.Em±	0.03	0.03	0.02	0.40	0.41	0.40
C.D. (P=0.05)	0.07	0.08	0.07	1.14	1.17	1.14
Interactions (D x T)						
D ₁ T ₁	3.83	4.02	3.93	92.00	93.33	92.67
D ₁ T ₂	3.78	3.99	3.89	90.33	91.33	90.83
D ₁ T ₃	3.90	4.09	4.00	94.67	95.33	95.00
D ₁ T ₄	3.73	3.96	3.85	87.00	87.67	87.33
D ₂ T ₁	3.69	3.89	3.79	91.67	92.67	92.17
D ₂ T ₂	3.56	3.76	3.66	89.33	90.33	89.83
D ₂ T ₃	3.73	3.92	3.82	94.33	95.33	94.83
D ₂ T ₄	3.53	3.72	3.62	85.67	86.67	86.17
D ₃ T ₁	4.44	4.66	4.55	96.00	96.67	96.33
D ₃ T ₂	4.47	4.61	4.54	95.33	96.33	95.83
D ₃ T ₃	4.50	4.70	4.60	98.00	98.67	98.33
D ₃ T ₄	4.35	4.55	4.45	95.00	95.67	95.33
D ₄ T ₁	4.23	4.47	4.35	93.33	94.33	93.83
D ₄ T ₂	4.22	4.40	4.31	92.67	93.67	93.17
D ₄ T ₃	4.40	4.51	4.45	96.67	97.33	97.00
D ₄ T ₄	4.01	4.21	4.11	89.33	90.67	90.00
D ₅ T ₁	3.44	3.67	3.55	90.33	91.33	90.83
D ₅ T ₂	3.54	3.74	3.64	87.00	88.33	87.67
D ₅ T ₃	3.50	3.69	3.60	88.33	89.33	88.83
D ₅ T ₄	3.07	3.23	3.50	85.00	86.00	85.50
S.Em±	0.06	0.06	0.06	0.89	0.91	0.89
C.D. (P=0.05)	0.16	0.18	0.16	2.54	2.61	2.55

Table 2: Effect of dates of bulb planting and application of foliar nutrition on coefficient velocity of germination and speed of germination in onion cv. Arka Kalyan

Treatment Planting time (D)	coefficient velocity of germination			speed of germination		
	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled
D ₁ : OCT-1 st	59.49	55.82	57.65	18.64	19.24	18.94
D ₂ : OCT-15 th	55.72	51.79	53.75	18.27	18.76	18.52
D ₃ : NOV-1 st	68.00	67.55	67.78	20.05	20.51	20.28
D ₄ : NOV-15 th	64.25	61.00	62.63	19.14	19.90	19.52
D ₅ : DEC-1 st	51.75	47.96	49.85	17.31	17.79	17.55
S.Em±	1.16	0.93	0.99	0.12	0.14	0.11
C.D. (P=0.05)	3.32	2.67	2.83	0.34	0.40	0.32
Application of foliar nutrition (T)						
T ₁ : Borax @ 0.25 %	59.05	56.23	57.64	18.88	19.39	19.13
T ₂ : Potassium nitrate @ 0.5 %	60.60	57.40	59.00	18.70	19.27	18.99

T ₃ :Micronutrient mixture @0.25%	62.55	58.73	60.64	18.91	19.55	19.23
T ₄ :Control	57.17	54.93	56.05	18.23	18.75	18.49
S.Em±	1.04	0.83	0.88	0.11	0.12	0.10
C.D. (P=0.05)	2.97	2.39	2.53	0.31	0.36	0.29
Interactions (D x T)						
D ₁ T ₁	57.87	55.00	56.43	18.80	19.11	18.95
D ₁ T ₂	60.67	56.50	58.58	18.45	19.17	18.81
D ₁ T ₃	61.43	57.60	59.52	18.98	19.65	19.31
D ₁ T ₄	58.00	54.17	56.08	18.35	19.02	18.68
D ₂ T ₁	55.20	51.00	53.10	18.41	18.81	18.61
D ₂ T ₂	56.00	52.67	54.33	18.38	18.71	18.55
D ₂ T ₃	58.33	53.67	56.00	18.33	18.91	18.62
D ₂ T ₄	53.33	49.83	51.58	17.97	18.61	18.29
D ₃ T ₁	67.67	67.00	67.33	20.17	20.68	20.43
D ₃ T ₂	69.33	68.00	68.67	19.86	20.32	20.09
D ₃ T ₃	73.67	70.20	71.94	20.33	20.83	20.58
D ₃ T ₄	61.33	65.00	63.17	19.81	20.22	20.02
D ₄ T ₁	63.50	60.67	62.08	19.28	19.92	19.60
D ₄ T ₂	64.67	61.33	63.00	19.18	19.85	19.51
D ₄ T ₃	65.67	62.67	64.17	19.05	20.07	19.56
D ₄ T ₄	63.17	59.33	61.25	19.04	19.75	19.39
D ₅ T ₁	51.00	47.50	49.25	17.75	18.41	18.08
D ₅ T ₂	52.33	48.50	50.42	17.65	18.31	17.98
D ₅ T ₃	53.67	49.50	51.58	17.85	18.27	18.06
D ₅ T ₄	50.00	46.33	48.17	16.00	16.17	16.08
S.Em±	2.32	1.86	1.98	0.24	0.28	0.22
C.D. (P=0.05)	6.65	5.34	5.66	0.68	0.80	0.64

Table 3: Effect of dates of bulb planting and application of foliar nutrition on Seedling Vigour Index-I and Seedling Vigour Index-II in onion cv. Arka Kalyan

Treatment Planting time (D)	Seedling Vigour Index-I			Seedling Vigour Index-II		
	2015-16	2016-17	Pooled	2016-17	2015-16	Pooled
D ₁ : OCT-1 st	1810	1835	1823	2024	2087	2056
D ₂ : OCT-15 th	1774	1799	1786	1955	2022	1989
D ₃ : NOV-1 st	1892	1916	1904	2260	2326	2293
D ₄ : NOV-15 th	1850	1875	1863	2126	2196	2161
D ₅ : DEC-1 st	1747	1771	1759	1807	1868	1837
S.Em±	1.63	1.75	1.56	17.53	19.73	18.53
C.D. (P=0.05)	4.68	5.01	4.46	50.17	56.48	53.04
Application of foliar nutrition (T)						
T ₁ : Borax @ 0.25 %	1819	1844	1832	2074	2140	2107
T ₂ : Potassium nitrate @ 0.5 %	1811	1836	1824	2018	2088	2053
T ₃ :Micronutrient mixture @0.25%	1830	1853	1842	2128	2193	2160
T ₄ :Control	1798	1823	1811	1917	1978	1947
S.Em±	1.46	1.56	1.39	15.68	17.65	16.57
C.D. (P=0.05)	4.18	4.48	3.99	44.88	50.52	47.44
Interactions (D x T)						
D ₁ T ₁	1815	1840	1828	2047	2110	2079
D ₁ T ₂	1806	1830	1818	2003	2071	2037
D ₁ T ₃	1825	1850	1838	2130	2193	2162
D ₁ T ₄	1795	1820	1808	1917	1975	1946
D ₂ T ₁	1775	1800	1787	1991	2059	2025
D ₂ T ₂	1770	1795	1783	1927	1994	1961
D ₂ T ₃	1785	1810	1798	2063	2133	2098
D ₂ T ₄	1764	1790	1777	1840	1903	1872
D ₃ T ₁	1895	1920	1908	2273	2337	2305
D ₃ T ₂	1885	1910	1898	2224	2298	2261

D ₃ T ₃	1914	1932	1923	2335	2400	2368
D ₃ T ₄	1874	1900	1887	2206	2269	2237
D ₄ T ₁	1855	1880	1868	2140	2210	2175
D ₄ T ₂	1845	1870	1858	2112	2181	2146
D ₄ T ₃	1865	1890	1878	2230	2294	2262
D ₄ T ₄	1835	1860	1848	2022	2098	2060
D ₅ T ₁	1755	1780	1768	1919	1986	1952
D ₅ T ₂	1750	1775	1763	1825	1897	1861
D ₅ T ₃	1760	1785	1773	1882	1944	1913
D ₅ T ₄	1723	1743	1733	1602	1643	1623
S.Em±	3.27	3.50	3.11	35.05	39.46	37.06
C.D. (P=0.05)	9.35	10.01	8.91	100.35	112.96	106.09

Table 4: Effect of dates of bulb planting and application of foliar nutrition on field emergence and electrical conductivity in onion cv. Arka Kalyan

Treatment	Field Emergence (%)			Electrical conductivity (Ds/m)		
	2015-16	2016-17	Pooled	2016-17	2015-16	Pooled
Planting time (D)						
D ₁ : OCT-1 st	86.92	88.50	87.71	0.670	0.650	0.660
D ₂ : OCT-15 th	85.08	86.67	85.88	0.674	0.654	0.664
D ₃ : NOV-1 st	91.17	92.71	91.94	0.662	0.642	0.652
D ₄ : NOV-15 th	89.63	91.17	90.40	0.666	0.646	0.656
D ₅ : DEC-1 st	84.58	86.17	85.38	0.683	0.667	0.675
S.Em±	0.58	0.56	0.57	0.001	0.002	0.001
C.D. (P=0.05)	1.66	1.61	1.63	0.005	0.005	0.004
Application of foliar nutrition (T)						
T ₁ : Borax @ 0.25 %	87.25	88.75	88.00	0.669	0.649	0.659
T ₂ : Potassium nitrate @ 0.5 %	86.10	87.67	86.88	0.671	0.651	0.661
T ₃ :Micronutrient mixture @0.25%	90.00	91.53	90.77	0.668	0.648	0.658
T ₄ :Control	86.55	88.22	87.38	0.675	0.658	0.666
S.Em±	0.52	0.50	0.51	0.001	0.001	0.001
C.D. (P=0.05)	1.49	1.44	1.46	0.004	0.004	0.004
Interactions (D x T)						
D ₁ T ₁	87.00	88.50	87.75	0.669	0.649	0.659
D ₁ T ₂	86.17	87.83	87.00	0.670	0.650	0.660
D ₁ T ₃	87.83	89.50	88.67	0.668	0.648	0.658
D ₁ T ₄	86.67	88.17	87.42	0.671	0.651	0.661
D ₂ T ₁	84.00	85.50	84.75	0.673	0.653	0.663
D ₂ T ₂	83.17	84.67	83.92	0.675	0.655	0.665
D ₂ T ₃	87.33	88.83	88.08	0.673	0.653	0.663
D ₂ T ₄	85.83	87.67	86.75	0.676	0.656	0.666
D ₃ T ₁	90.92	92.42	91.67	0.661	0.641	0.651
D ₃ T ₂	90.00	91.67	90.83	0.662	0.643	0.652
D ₃ T ₃	92.83	94.33	93.58	0.660	0.640	0.650
D ₃ T ₄	90.92	92.42	91.67	0.663	0.644	0.653
D ₄ T ₁	89.00	90.50	89.75	0.665	0.645	0.655
D ₄ T ₂	88.50	90.00	89.25	0.666	0.646	0.656
D ₄ T ₃	91.33	92.83	92.08	0.664	0.644	0.654
D ₄ T ₄	89.67	91.33	90.50	0.667	0.647	0.657
D ₅ T ₁	85.33	86.83	86.08	0.679	0.659	0.669
D ₅ T ₂	82.67	84.17	83.42	0.681	0.662	0.671
D ₅ T ₃	90.67	92.17	91.42	0.677	0.657	0.667
D ₅ T ₄	79.67	81.50	80.58	0.697	0.692	0.694
S.Em±	1.16	1.12	1.14	0.002	0.003	0.003
C.D. (P=0.05)	3.32	3.21	3.26	0.009	0.009	0.008

CONCLUSION

Higher seed quality can be obtained in onion Cv. Arka Kalyan by bulb planting in the month of November first coupled with further spraying of micronutrient mixture at (0.25 %) which accounted for 26.52 per cent increase over the control.

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