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Research Article

EFFECT OF AGE OF SEEDLING ON GROWTH, SIZE OF BULB AND YIELD OF *RABI* ONION *cv*. N-53 AS INTERCROP IN MANGO ORCHARD UNDER THE CLIMATIC CONDITION OF BASTAR PLATEAU

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Abstract: The field experiment was conducted on *rabi* onion cv. N-53 (*Allium cepa* L.) at Horticulture Instructional Farm, College of Horticulture & Research Station, Jagdalpur during the year 2015-2016 to study the effect of age of seedlings on growth, size of bulb and yield of onion *cv*. N-53 as intercrop in mango orchard under the climatic condition of Bastar plateau. Different age of seedling did not show significant effect on plant stand per plot. The plant height, leaf length per plant, number of leaves per plant, grade wise yield, weight of doubled per plot, total yield per plot, marketable yield per plot, were measured and significantly higher with transplanting of 40 days age of seedling *i.e.*, treatment T4. The minimum days required for maturity (142.00) was recorded with transplanting of 40 days age of seedling.

Keywords: *Onion, Seedling, Age of seedling, grade wise yield*

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Introduction

Onion (*Allium cepa* L.) is one of the important cash vegetable crops grown throughout the world. Onion belongs to the family Alliaceae and is said to be native of Central Asia and Mediterranean region. It is originated in Central Asia and used as a vegetable or spice both in the raw and mature bulb stage [1], also, considered as second most important horticultural crop after tomatoes [2]. The edible portion is a modified stem which is known as 'bulb' and develops under-ground. Onion is popularly used green as well as mature bulb. It is a popular salad crop and mature onion bulbs are widely used as a cooked vegetable in soups, stews and casseroles in addition to a flavouring agent in many additional dishes. Because of its importance in cookery, onion is called 'queen of the kitchen' by Germans. It is valued for its characteristics flavour, pungent taste and medicinal importance [3]. Onion is biennial plant but mainly grown for the production of bulb, as it is important storage organ of the plant and considers as overwintering stage of the life cycle. In Pakistan, onion is grown throughout the country and consumed in large quantities as an important part of daily food. Onion bulb contains 86.6 gm moisture and food value per 100 gm of edible portion is protein 1.2 gm, fat 0.1 gm, mineral matter 0.4 gm, fibre 0.6 gm, carbohydrate 11.1 gm, calories 50 Kcal, phosphorus 50 mg, potassium 127 mg, calcium 46.9 mg, magnesium 16 mg, iron 0.6 mg, sodium 4 mg, copper 0.18 mg, vitamin-C 11 mg, niacin 0.4 mg, thiamine 0.08 mg, riboflavin 0.01 mg, folic acid free 15 mg and folic acid-total 6 mg [4]. India is the second largest producer of onion in the world and occupies 8, 82,000hectares area with a production of 18,736,000 tonnes and productivity of 21.2 metric tonnes/ ha. Maharashtra is a leading state in area (20,000 hectares) and production (3,14,600 tonnes). Gujarat is the leading state in productivity (24.9 metric tonnes/ha) followed by Bihar, Haryana, Andhra Pradesh, Madhya Pradesh and Chhattisgarh [4]. Onion is physiologically a long-day plant for bulbing and generally planted during *Rabi* season under agro-climatic conditions of Bastar plateau of Chhattisgarh. In spite of suitable agro-climatic conditions of the region for production of onion, the production and productivity are not increasing due to several production constraints. The production and quality of onion bulb is affected by many factors like temperature, light, varieties, sowing and transplanting date, plant geometry, nutrition, irrigations, cultural practices *etc*. Among then sowing and transplanting time is one of the most important factors with greatly influence the growth and yield of onion. The optimum time of sowing is generally governed by climate of region particularly temperature and photoperiods. Earlier studies conducted as intercrop in mango orchard under the climatic condition of Bastar plateau of Chhattisgarh revealed that onion sowing on 25th Oct. with the seedling age of 30 days produced maximum marketable bulb yield and with the advancement of seedling age from 30 to 60 days, there was a decrease in bulb yield [5]. The yield reduction due to increasing nursery age may, however, be compensated with manipulation of different age of onion seedling planting in shade condition of mango orchard.

Materials and Methods

A field experiment was conducted on sandy loam soil of Horticulture Instructional Farm, College of Horticulture and Research, Jagdalpur, Bastar, IGKV, Raipur during the year 2014-2015. Experimental details are presented in [Table-1]. The metrological data was taken from department of metrological, S. G. College of Agriculture, Jagdalpur and showed that mean maximum temperature 36.7°C was in month of April and mean minimum temperature 6.8°C was in Month of January. The maximum relative humidity 97.00% was in month of January while minimum 27.4n% in March. Average rain fall for the whole growing season was 10.85 mm with 57 mm highest rainfall in growing period in the month of April.

Results and Discussion

Plant height

Data presented in [Table-2] showed that seedling age significantly affected plant height at initial age of 30 days and maturity stage of 90 days. Plants transplanted after 30 days produced tallest 76.40 cm and 64.67 cm plants at the maturity stage of 90 days respectively. Plant growth was minimum for late transplanted seedlings which remained shorter as compared to early transplanted seedling. The result was in agreement with Kanton, *et al*., (2003) [6], Kumbhkar, *et al*., (2012) [7], and

Table-1 Description of experiments

Treatment Combination (Age of seedlings)	Growth and Yield Attributes Character	Statistical Design
30 Days (T1)	plant height (cm), number of leaves per plant, leaf length, size (weight basis) total bulb yield (kg)/plot and total bulb yield (tonnes)/ha	Randomized Block Design with three replications
35 Days(T2)		
40 Days (T3)		
45 Days (T4)		
50 Days (T5)		
55 Days (T6)		
60 Days((T7)		

Table-2 Effect of seedling age on plant height (cm), leaf length (cm), number of leaves / plant, yield (kg/plot) and Yield (q/ha) in Onion

Treatment	Plant Height (cm)			Leaf Length (cm)			No of Leaves (per /plant)			Yield	Yield
	30 days	60days	90 days	30 days	60days	90 days	30 days	60days	90 days	(Kg/per	(q/ha)
T1	61.60	75.53	76.40	53.67	52.27	36.67	6.53	7.33	8.07	17.00	283.33
T2	57.33	64.27	64.67	51.13	50.80	30.67	6.47	7.00	6.47	18.03	300.56
T3	39.93	56.13	52.40	36.67	45.80	29.73	6.07	6.27	6.13	20.67	344.44
T4	30.27	46.27	48.27	27.60	34.93	29.27	4.80	4.93	5.40	20.33	338.89
T5	26.87	44.40	45.53	24.73	35.73	25.73	5.27	5.40	5.40	14.93	215.56
T6	20.40	36.23	42.73	18.93	31.87	23.53	5.60	5.33	4.73	11.83	197.22
T7	19.77	31.50	42.00	17.93	29.00	22.83	4.60	5.00	4.27	10.57	175.89
CD	8.72	7.64	NS	9.30	NS	NS	16.70	NS	1.09	6.05	96.08
SE (±)	2.80	2.46	0.56	2.98	5.63	0.69	5.36	3.20	0.35	1.94	30.84
CV (%)	13.25	12.93	17.45	10.21	24.34	20.44	17.47	19.58	10.50	20.78	20.14

Table-3 Effect of seedling age on bulb size *i.e*., weight of different grade bulbs (kg/plot) in onion

Treatment	Grade A (100to 250 gm)	Grade B (50 to 100 gm)	Grade C (< 50 gm)	Double bulb or defected
T1	5.08	5.90	4.68	1.47
T2	5.88	6.07	4.82	1.33
T3	6.27	6.53	5.12	1.33
T4	6.11	6.93	4.92	1.27
T5	4.27	4.74	4.99	1.14
T6	3.40	3.50	3.88	1.05
T7	2.95	3.12	3.50	1.00
CD	NS	2.00	NS	NS
SE (±)	0.82	0.64	0.56	0.14
CV (%)	29.12	21.12	21.10	19.86

Tayeb Md, *et al*., (2017) [8] who reported that tallest plants were obtained when seedlings were transplanted at 30 days after sowing.

Leaf length

Seedling age significantly affected leaf length at initial age of 30 days and no significantly difference at maturity stage of 90 days. For 30 days, 60 days and maturity stage of 90 days, maximum leaf length (53.27,52.27 and 36.67 cm respectively) was observed when seedlings were transplanted after 30days while minimum was in later seedling age. The similar results were obtained Kumbhkar, *et al*., (2012) [7] and Amjad, *et al*., (2016) [9] reported that tallest lengths were obtained when seedlings were transplanted at 30 days after transplanting.

Number Leaf per plant

Number of leaves plant per showed that both seedling age significantly difference the leaf number at initial stage. The results revealed that more numbers of leaves (8.07) were produced by 30-days seedling and minimum number of leaves (4.73) by 60-days seedling. Ibrahim (2010) reported that there was significant difference in leaves number per plant among seedlings transplanted at different time. While leaves number at 90 days showed that seedling age had significant effect on number of leaves. Maximum numbers of leaves (8.07) were produced while minimum numbers of leaves (4.73) were recorded. The result was in agreement with Kumbhkar, *et al*., (2012) [7] and Gautam, *et al*., (2006) [10] reported that number leaves were obtained when seedlings were transplanted at 30 days after sowing. Early transplanting plants mature early having less number of leaves due to leaf falling as com

Yield

Higher bulb yields of 344.44 q/ha and 338.89 q/ha were recorded from 40 days and 45 days of old seedling followed by 300.56 q/ha and 283.33q/ha in 35 days and 30 days and 215.56 q/ha, 197.22 q/ha and 175.89 q/ha in 50 days, 55 days and 60 days of old seedling respectively [Table-2]. This was probably due to higher mortality rate in these plots. However, bulb yield was higher in 45 days old seedlings but over all affect was significant.

Grade 'A' bulbs

The results indicated no significant effect of different seedling age on weight of different grade 'A' bulbs. The maximum weight of grade 'A' bulbs was observed under T1 (40 days) *i.e*., 6.27kg/plot followed T1 (45 days) *i.e*., 6.11kg/plot. Minimum weight of grade 'A' bulbs was recorded under seedling age T1 (60 days) *i.e*., 2.95 kg/plot. The increase in bulb diameter under younger seedling is obvious in the present study which contributed to the greater weight of grade 'A' bulbs. The similar results are reported by Heath, (1943) [11] in relation to this character. The greater bulb yield of A size achieved from younger seedlings could be attributed to better plant growth as reflected in taller and more leafy plants and superior bulb dimension achieved by plants vigour from younger seedlings compared to their older counter parts. Since the plants developed from younger transplants seemed to be more efficient in conversion to photosynthate into larger bulbs as indicated by higher bulb yields. The results are supported by the finding of Kanton, *et al*., (2003) [6] and Faruq, *et al*., (2003) [12]. But the results are in contradiction of finding of [13] reported that increase in seedlings age (56 days old) resulted in larger bulbs under Michigan country (USA) which may be due to influence of prevailing climatic conditions of that region.

Grade 'B' bulbs

The results indicated significant effect of different seedling age on weight of different grade 'B' bulbs.

The weight of grade 'B' bulbs was recorded 6.93kg/plot from 45 days and minimum weight of grade 'B' bulbs were recorded 3.12 kg/plot from 60 days of seedling with the delay in seedling age from T4 (45 days) to T7 (60 days). In the present study, the improvement in weight of grade 'B' bulb with younger seedling could be attributed possibly to favoured bulb growth and development which produce bigger bulbs. The increase bulb diameter under younger seedling is obvious in the present study which contributed to the greater weight of grade 'B' bulbs. The similar results are reported by Heath, (1943) [11] in relation to this character. The results can be supported by the fact that due to improved vegetative growth of younger seedling the leaf canopy light interception by the leaf blade may be higher. The finding is supported by the results [12].

Grade 'C' bulbs

The results indicated no significant effect of different seedling age on grade 'C' bulbs. The weight of grade 'C' bulbs was increased from 5.12kg/plot to 3.50kg/plot with the delay in seedling age from T1 (40 days) to T7 (60 days). In the present study, the maximum weights of lightest onion bulbs were from plants developed from older transplants and the plants from younger transplant produced the minimum yield of small size bulbs. The finding can be supported by the fact that shortest plants were developed from older transplant which might have contributed towards minimum yield of small size bulbs (grade 'C'). Similar results were reported by Kanton, *et al*., (2008) [14] under Ghana condition.

Weight of double bulbs (kg/plot)

The results indicated no significant effect of different seedling age on weight of double bulbs. The weight of double bulbs was registered only with T1 (30 days) *i.e*., 1.47kg/plot, T2 and T3 (35 days and 40 days) *i.e*., 1.33kg/plot and 1.33 kg/plot and T7 (60 days) *i.e*., 1.00kg/plot. The results are in accordance with the observation of Rabinowitch, (1979) [15] who reported that environmental conditions changing with transplanting time (seedling age) affected the tendency for axillary shoot development leading to double bulbs. In the present study, higher yield of double bulbs might be due to relatively longer cooler periods experienced by younger seedlings during bulbs development stage.

Conclusion

In conclusion early age of 45 days of old seedling and irrigation immediately after transplanting improved survival and establishment of onion seeding and results in number of bulbs and thus higher yield. Though use of older seedling results in bigger bulbs whereas the yield loss with use of 60 days seedling, discourages use of aged seedlings. Hence, use of 45 days old seedling is advisable for getting good yield in *rabi* onions in mango orchard under the climatic condition of Bastar plateau.

Application of research: The effect of different seedling age was studied to understand the growth and yield attributing characters of Onion. The effect of three seedling ages and exogenous application of different growth retardants was studied to understand the growth and yield of onion.

Research Category: Seed science

Abbreviations:

CD: Critical difference
CV : Coefficient of Variation
SE : standard error

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References

[1] Barzegar M., Rajabi A., Hassandokht M.R. and Jabbari A. (2008) *Hort Environ Biotech*., 49(2), 121-127.
[2] Griffiths, G., Trueman L., Crowther T., Thomas B. and Smith B. (2002) *Phytotherap Res*., 16, 603-615.
[3] Padmini K., Gowda R.V. and Naik L.B. (2007) *J. Hort. Sci*., 2(1), 47-49.
[4] Anonymous (2015) *Annual Report, National Horticulture Board. Area and Production state wise. Ministry of Agriculture, Government of India.*
[5] Vaishnava D. (2012) *Effect of date of nursery sowing and seedling age on growth, yield quality of rabi onion in Chhattisgarh plains. M.Sc. Thesis, IGKV, Raipur.*
[6] Kanton R.A.L., Abbey L., Hilla R.G., Tahil M.A. and Jan N.D. (2003) J. Veg.Crop Prod., 8(2), 27-37.
[7] Kumbhkar B.R., Patel N.M., Bhadauria H.S. and Wankhade V.R. (2012) *Advance Research Journal of Crop Improvement*, 3(2), 169-170
[8] Tayeb Md., Amjad M., Ali M., Muhammad Hanif, Mahmoud Abdalla, Mahmoud Hussein, Abdul H. and Abas N. (2017) *International Journal of Agricultural and Environmental Research*, 3(2), 232-239.
[9] Amjad S. M. T., Hayat M., Ahmad H. and Ahmed S. (2016) *Pure Appl. Biol*., 5(2), 223-233.
[10] Gautam I.P., Khatri B. and Paudel G.P. (2006) *Nepal Agric. Res*. J., 7, 21-26.
[11] Heath O.V.S. (1943) *Ann. Appl. Biol*., 30, 308-319.
[12] Faruq M.O., Alam M.S., Rahman M., Alam M.S. and Sharfudddin A.F.M. (2003) *Pakistan J. of Biol. Science*, 6(13), 1179-1182.
[13] Herison C., Masabni J.G. and Zandstra B.H. (1993) *Hort. Sci*., 28(1), 23-25
[14] Kanton R.A.L., Abbey L. and Hilla R.G. (2008) *J. Veg. Crop Prod*., 26, 27-37.
[15] Rabinowitch H.D. (1979) *Ann. Appl. Biol*., 93, 63-66.