International Journal of Agriculture Sciences
ISSN: 0975-3710&E-ISSN: 0975-9107, Volume 10, Issue 6, 2018, pp.-5536-5538.
Available online at http://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

EFFECT OF FOLIAR APPLICATION OF NUTRIENTS ON FLOWERING AND YIELD PERFORMANCE OF DIFFERENT CASHEW VARIETIES

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Received: March 19, 2018; Revised: March 25, 2018; Accepted: March 26, 2018; Published: March 30, 2018

Abstract- The study was conducted at Agricultural and Horticultural Research Station, Ullal, Mangalore, Dakshina Kannada, Karnataka during 2015 and 2016 on 15 years old cashew plantation of different varietal plot. The results revealed that early bearing type of cashew recorded significantly highest seed weight in Ullal-3 UT of 11.03 gm and highest apple weight recorded in UN-50 UT (101.60gm) followed by UN-50 T (98.40 gm). Significantly highest seed size was observed in UN-50 UT (12.45 gm) followed by UN 50 T (11.55 gm) and highest apple size was recorded in Ullal-3 UT (40.30 gm) where as lowest apple size was recorded in Ullal-4 T (24.30 gm). Highest no. of perfect flowers was recorded in Venurla-7 T (28.80). Significantly highest yield was recorded in Vengurla-7 T **(**14.42kg per tree**)** followed by Ullal-2 T (13.48 kg per tree). In late bearing type of cashew varieties significantly highest seed weight was recorded in Nairobi UT 10.66 gm followed by Nairobi T (10.27 gm). Significantly highest apple weight was recorded in Nairobi UT (120.20 gm) followed by Nairobi T (117.36 gm) and highest seed size was recorded in Ullal-1 UT (10.60 gm) followed by VRI-3 T (9.35 gm). Significantly highest apple size was recorded in Nairobi UT (43.50 gm) and highest no. of perfect flowers was recorded in NDR 2-1 T (28.60). Significantly highest yield was recorded in NDR 2-1 T **(**18.15kg per tree**)** followed by Ullal-1 T (17.23 kg per tree).

Key words- Foliar, Nutrient, flower, Yield, Varieties, *Anacardium occidentale* L.

Citation Lakshmana, *et al*., (2018) Effect of Foliar Application of Nutrients on Flowering and Yield Performance of Different Cashew Varieties. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 10, Issue 6, pp.-5536-5538.

Introduction

Cashew, *Anacardium occidentale* L., is a nut crop of world importance. The major cashew growing states in India are Kerala, Karnataka, Goa, Maharashtra on West Coast and Tamil Nadu, Andhra Pradesh, Orissa, West Bengal on East coast. Maharashtra leads in area, production and productivity with 1.86 lakh hectares, 2.56 lakh MT and 1378 kg/ha respectively. Karnataka produces cashew 85000 MT with an area 1.27 lakh hacters annually [1]. Large area of old senile seedling orchards, low plant population, poor canopy management and non-adoption of improved package of practices are considered as the major limiting factors in cashew production [2]. Development, popularization and area increase under improved varieties / hybrids and good agricultural practices like application of nutrients to increase the yield is very important to increase the cashew productivity. One of the major constraints to increase the cashew productivity is poor nutrient management practices. However, some of studies proved that the cashew responds very well to fertilizer and irrigation. There is a great scope for improving the fruit set, number of nuts and nut yield per tree through fertilization, foliar spray with nutrients and plant growth regulators as evidenced in many other horticultural crops [3]. So, there is a need to study the effect of foliar application of nutrients on flower set and yield of different varieties of cashew in coastal region of Karnataka. By keeping in this view, the present study was under taken in cashew with an objective of increasing the flowering, fruit set and yield of different selected cashew varieties.

Materials and Methods

The study was conducted at Agricultural and Horticultural Research Station, Ullal, Mangalore, Dakshina Kannada, Karnataka during 2015 and 2016 in 15 years old cashew plantation of different varietal plot. The experiment was laid out in randomised block design (RBD) with 10 treatments and 5 replications. The five early harvest variety like Ullal-2, Ullal-3, Ullal-4, UN-50 and Vengurla-7 and five late harvest variety like Ullal-1. NDR2-1, Bhaskara, Nairobi and VRI-3 were sprayed with 2 % 19:19:19 (N:P:K) at peak flushing and flowering period of cashew trees covering the entire canopy and controlled trees were not sprayed. The observations like perfect flowers (no), yield per tree (kg) seed weight (gm), apple weight (gm), seed size (cm, apple size (cm) were recorded. The data were statistically analysed by Using ANOVA.

Result and Discussion

It is revealed from the [Table-1] and [Table-2] that, foliar application of nutrients significantly influenced the early and late bearing of cashew varieties on apple weight, seed size, apple size, no. of perfect flowers per m^2 and yield in both the years 2015 and 2016.The data pertaining to the seed weight is presented in [Table-1]. During 2015-16, significantly highest seed weight was recorded in Ullal-3 UT of 11.03 gm. Lowest pooled seed weight was recorded in Ullal-2 T which recorded 6.86 gm. Significantly highest apple weight was recorded in UN-50 UT (101.60gm) followed by UN-50 T recorded 98.40 gm. Lowest apple weight was recorded in Ullal-2 T (55.40 gm). Significantly highest seed size was recorded in UN-50 (12.45 gm) followed by UN 50 T (11.55 gm). Significantly lowest seed size

was recorded in Ullal-2 T (6.97 gm) [Table-1]. Significantly highest apple size was recorded in Ullal-3 UT (40.30 gm) whereas lowest apple size was recorded in Ullal-4 T (24.30 gm) [Table-1]. Significantly highest no. of perfect flowers was recorded in Venurla-7 T (28.80) followed by Ullal-2 T which recorded a value of 25.40. Significantly lowest number of perfect flowers per m^2 was recorded in un-50 UT (11.90) [Table-1]. The data pertaining to the yield kg per tree is presented in [Table-1].

Table-1 *Effect of foliar nutrient application on flowering and yield of different cashew varieties*

Early bearing cashew types:

Sl. No.	Treatments	Seed weight (gm)			Apple Weight (gm)			Seed size (cm)			Apple size (cm)			No. of perfect flowers per m^2			Yield per tree (kg)		
		2016	2017	Pooled value	2016	2017	Pooled value	2016	2017	Pooled value	2016	2017	Pooled value	2016	2017	Pooled value	2016	2017	Pooled value
1	Ullal -2T	7.03	6.69	6.86	56.40	54.40	55.40	7.05	6.90	6.97	24.00	24.80	24.40	23.20	25.80	24.50	13.32	13.48	**13.40**
2	Ullal- 2UT	7.19	7.20	7.19	58.40	58.80	58.60	7.60	7.50	7.55	26.00	26.40	26.20	14.200	14.60	14.40	11.36	11.12	11.24
3	Ullal-3T	10.79	10.12	10.45	74.20	74.00	74.10	9.60	9.30	9.40	36.80	36.60	36.70	22.400	23.20	22.80	10.66	10.52	10.59
4	Ullal-3UT	11.05	11.02	**11.03**	76.40	77.80	77.10	10.60	10.50	10.55	40.00	40.60	**40.30**	13.00	13.40	13.20	9.56	9.74	9.65
5	Ullal- 4T	8.66	8.44	8.55	45.80	45.60	45.70	8.40	8.50	8.45	24.20	24.40	24.30	24.80	23.40	24.10	12.76	13.18	12.97
6	Ullal-4UT	8.82	8.82	8.82	48.00	48.60	48.30	8.85	9.00	8.92	26.20	26.00	26.10	14.20	15.40	14.80	9.04	8.97	9.01
7	UN-50T	10.21	9.14	9.67	98.40	98.40	98.40	11.80	11.30	11.55	25.20	25.00	25.10	19.40	19.80	19.60	9.72	9.80	9.76
8	UN-50UT	10.42	10.12	10.27	101.20	102.00	101.60	12.50	12.40	12.45	28.00	27.80	27.90	11.00	12.80	11.90	7.52	7.80	7.66
9	Vengurla-7T	7.90	7.98	7.94	85.98	85.60	85.79	9.95	10.00	9.97	31.20	30.60	30.90	28.00	28.80	28.40	14.64	14.20	**14.42**
10	Vengurla-7 UT	8.12	8.10	8.11	88.40	88.60	88.50	10.50	10.70	10.60	33.80	31.40	32.60	15.00	14.40	14.70	11.54	12.20	11.87
	F-test	**	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	SEm+	0.71	0.12	0.19	1.06	1.51	0.95	0.35	2.50	0.23	0.95	0.85		1.902	1.227	1.16	0.17	1.42	0.67
	CD@5%	1.14	1.08	2.40	1.14	1.61	1.46	2.82	0.30	2.77	2.52	2.26		7.974	4.973	6.97	1.24	9.96	6.89

T= Treated UT= Untreated

The results showed that significantly highest yield was recorded in Vengurla-7 T **(**14.42kg per tree**)** followed by Ullal-2 T (13.48 kg per tree). Significantly lowest yield was recorded UN-50 UT (7.66 kg per tree) followed by Ullal-4 UT which recorded (9.01 kg per tree).It is revealed from the [Table-2] that in late bearing cashew varieties recorded significantly highest seed weight in Nairobi UT 10.66 gm followed by Nairobi T which recorded 10.27 gm. Lowest seed weight was recorded in Ullal-1 T recorded 7.17 gm. Significantly highest apple weight was recorded in Nairobi UT (120.20 gm) followed by Nairobi T which recorded 117.36 gm. Lowest apple weight was recorded in Ullal-1T (36.65 gm). Significantly highest seed size was recorded in Ullal-1 UT (10.60 gm) followed by VRI-3 T (9.35 gm). Significantly lowest seed size was recorded in NDR 2-1 T (7.15 gm) followed by Bhaskar T (7.15 gm). Significantly highest apple size was recorded in Nairobi UT (43.50 gm) followed by Nairobi T, which recorded (42.10 gm), where as lowest apple size was recorded in Ullal-1 T (23.60 gm) [Table -2]. Significantly highest no. of perfect flowers was recorded in NDR 2-1 T (28.60) followed by Ullal-1 T which recorded 27.00 gm. Significantly lowest number of perfect flowers per m^2 was recorded in Nairobi UT 12.00 gm [Table-2]. The data pertaining to the yield kg per tree is presented in [Table-2]. The results showed that significantly highest yield was recorded in NDR 2-1 T **(**18.15kg per tree**)** followed by Ullal-1 T (17.23 kg per tree). Significantly lowest yield was recorded Nairobi UT (6.61 kg per tree) [Table-2]. Present results endorse the findings [4] reported two foliar sprays *viz*., NPK 19:19:19 @ one per cent at new flush stage (August) followed by a second spray of boron 0.1% + SOP 2% + MAP 1% at flowering stage (December) was found to be the best in increasing number of current season's shoot (3.25 Numbers), number of panicles (16.3 Numbers per m 2), percentage of bisexual flowers (31.9%), percentage of fruit set (11.5%) and yield (4.43 kg/ tree) in cashew grown under high density planting system. According to foliar spray of NPK 19:19:19 (1%) and MAP (1%) at flushing and flowering stage respectively enhanced the bisexual flowers in VRI 3 cashew [5]. Present results are more or less contrary to the findings of [6] reported in mango *cv*. Alphonso that foliar application of sulphate of potash 2 per cent was effective in improving the number of fruits and fruit yield per tree. Mono ammonium phosphate treatments increased vigour of trees, the number of flower clusters per tree, flower intensity, the number of fruits per tree in apple [7].It combined foliar application of micronutrient mixtures recorded the highest values in the treatment of 0.75% ZnSO4, 0.75% FeSO4, 0.75% CuSO4, 0.5% Borax, 0.2% MnSO4 applied as foliar spray along with the recommended dose of fertilizers (RDF) for the characters such as average apple weight (59.66 g), number of fruits per tree (2015.0), average nut weight (7.40 g), 100 nut weight (671.66 g), yield per tree (15.66 kg/tree) and estimated yield per ha (2.70 t/ha), followed by the treatment with 0.5% ZnSO4, 0.5% FeSO4, 0.5% CuSO4, 0.3% Borax, 0.1% MnSO4 applied as foliar spray along with the RDF which recorded higher values for the traits such as average apple weight (57.86 g), number of fruits per tree (1971), average nut weight (7.28 g), 100 nut weight (661.66 g), yield per tree (15.58 kg/tree) and estimated yield per ha (2.64 t/ha)[8].

Table-2 *Effect of foliar nutrient application on flowering and yield of different cashew varieties*

Late bearing cashew types

Sl. No.	Treatments	Seed weight (gm)			Apple Weight (gm)			Seed size (cm)			Apple size (cm)			No. of perfect flowers per m^2			Yeild per tree (kg)		
		2015	2016	Pooled value	2015	2016	Pooled value	2015	2016	Pooled value	2015	2016	Pooled value	2015	2016	Pooled value	2015	2016	Pooled value
1	Ullal -1 T	7.22	7.12	7.17	36.50	36.80	36.65	9.00	9.20	9.10	23.60	23.60	23.60	28.00	26.00	27.00	17.40	17.06	17.23
2	Ullal- 1UT	7.60	7.64	7.60	37.80	39.40	38.60	10.60	10.60	10.60	25.80	25.40	25.60	19.80	17.60	18.70	15.82	14.64	15.23
3	NDR 2-1 T	9.84	9.82	9.83	65.40	64.40	64.90	7.20	7.10	7.15	30.00	30.40	30.20	27.40	29.80	28.60	19.44	16.86	18.15
4	NDR 2-1 UT	10.12	10.18	10.15	67.56	68.60	68.08	7.80	7.90	7.85	31.60	30.80	31.20	14.80	18.80	16.80	16.36	15.80	16.08
5	Bhaskar T	8.84	8.88	8.86	45.44	44.60	45.02	7.00	7.30	7.15	24.80	24.20	24.50	23.60	26.80	25.20	12.72	15.29	14.00
6	Bhaskar UT	9.06	9.08	9.07	46.96	46.80	46.88	7.80	7.70	7.50	26.40	26.60	24.50	16.60	17.20	16.90	10.36	11.61	10.98
7	Nairobi T	10.50	10.04	10.27	118.32	116.40	117.36	8.00	8.10	8.05	42.00	42.20	42.10	16.00	13.60	14.80	7.52	10.66	9.09
8	Nairobi UT	10.78	10.54	10.66	120.00	120.40	120.20	9.00	9.00	9.00	44.40	42.60	43.50	12.40	11.60	12.00	6.38	6.84	6.61
9	VRI-3T	7.39	7.22	7.30	58.02	57.60	57.81	8.50	8.00	8.25	32.80	34.60	33.70	26.40	26.20	26.30	15.00	6.22	10.61
10	VRI-3UT	7.53	7.34	7.43	60.84	61.60	61.22	9.30	9.40	9.35	35.40	36.00	35.70	13.60	14.20	13.90	11.56	12.57	12.06
	F-test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	SEm+	0.13	0.18	0.13	0.91	1.58	0.97	0.29	0.36	0.23	2.28	0.90	1.22	1.05	0.91	1.25	0.74	0.44	1.63
	CD@5%	1.14	1.62	1.65	1.08	1.87	1.67	2.74	3.30	3.17	5.62	2.22	4.33	4.15	3.55	7.02	4.36	2.73	14.11

T= Treated UT= Untreated

Conclusion

Application of nutrients (19:19:19) showed beneficial effects on perfect flowers and yield of different cashew varieties. The foliar application of nutrients has significantly influenced the flower set and fruit set and increase in the yield. Proper application of nutrients is needed to achieve higher yield of cashew nut.

Application of research: Application of nutrients for cashew helps to increase in yield per tree and it will boosts the income of the farmers.

Research Category: Horticultural Research

Abbreviations:

DCCD: Director of Cashew nut and Cocoa Development

Acknowledgement / Funding: Author thankful to Indira Gandhi Krishi Vishwavidyalaya, Raipur, 492012, Chhattisgarh

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Research project name or number: PhD Thesis

Author Contributions: All author equally contributed

Author statement: All authors read, reviewed, agree and approved the final manuscript

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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