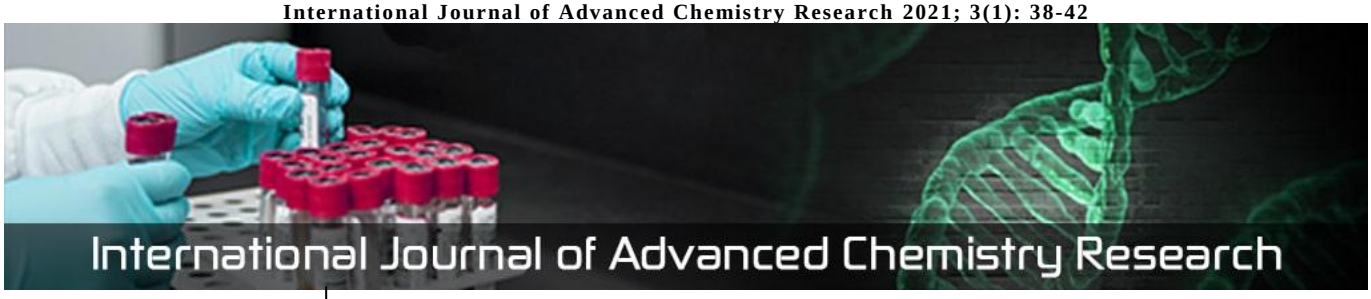

ISSN Print: 2664-6781
ISSN Online: 2664-679X
Impact Factor: RJIF 5.32
IJACR 2021; 3(1): 38-42
www.chemistryjournals.net
Received: 05-04-2021
Accepted: 08-05-2021

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Litter dynamics of mango trees grown in different shrink-swell soil series of Maharashtra

NP Navnage, AL Pharande, AD Kadlag and SP Bainade

Abstract
An experiment was conducted at central campus of Mahatma Phule Krishi Vidyapeeth, Rahuri to study the dynamics of monthly litter fall biomass and its chemical composition and nutrient return to soil were study under of mango trees under different soil series of Maharashtra. The result showed that higher quantity of liter biomass was produced in mango plantation under medium deep soil (Sawargaon soil series) over different soil series. Among mango plantation under different soil series, highest content of nutrients i.e. NPK and carbon was recorded in Sawargaon soil series as compare to other soil series. Maximum amount of nutrient return to soil through soil was recorded in mango plantation under medium deep soil over shallow and deep soil. On another hand carbon and nitrogen are most important of many element required for microbial decomposition of organic matter. The result revealed that numerically optimum C:N ratio (31.68) was recorded in litter leaf fall of mango plant under Sawargaon soil series as compare to other series.

Keywords: Litter fall, Mango, nutrient content, nutrient return, soil

Introduction
The litter of the forest is an important stage in the cycle of habitat conservation. It provides the return of nutrients and the replenishment of organic matter and supports a wide variety of riches for fauna and microorganisms. The mango tree plantation are covering the largest area in India among the all horticultural crops. Mango (*Mangifera indica*) is India's most important fruit crop and is regarded as the "King of Fruits". Mango is India's national fruit, steeped in Indian traditions and culture. The area cover by mango plantation in India is approximately of 1578.5 hector, among them highest area coverage in state of Andhra Pradesh, Uttar Pradesh. However, Maharashtra ranks third in total area of mango plantation. India produced 21.8 million metric tonnes of mango, accounting for 40 per cent of global production. Uttar Pradesh is India's largest mango producer, accounting for 21 per cent of total mango production (Database of National Horticulture Board, Ministry of Agriculture, Govt. of India). The addition of litter fall and return of nutrients through litter fall, especially N. P. K have been quantified in many studies Mohsin (2005) [1], Mohsin and Singh (2007) [3] and Mohsin and Singh (2008) [2]., but a meager information is available regarding return of nutrients through litter fall of mango plantation in central campus of M.P.K.V Rahuri field. Roots provide anchorage for the tree and serve the vital functions of absorption and translocation of water and nutrients. They exert a significant influence on soil profile development, and upon dying, roots contribute to soil organic matter content (Mc Claugherty *et al*.1982) [4]. Therefore, the study was carried out to assess the dynamic pattern and quantity of litter fall and to estimate the amount of nutrients return to soil during different months in plantations.

Material and Methods
The present study was carried out in mango orchard of horticultural field in central campus of Mahatma Phule Krishi Vidyapeeth Rahuri. The age of mango orchard was around 25 years, conventionally cultivated land and fallow land of three major soil series of Pargaon and Sawargaon were selected to conduct this experiment. However, for Nimone mango orchard was selected from Shrirampur Dist. Ahmednagar
Fallen leaf litter of tree was collected in one square meter litter trap on the tree floor randomly in each site. In each horticulture system three replication of litter trap were installed. Each trap was 2 mm mesh nylon supported by wooden sides with 20 cm height.

Litter from these traps was collected separately and dried in shade. The sample was collected in one month interval. The sample was weighed and converted it in t ha^{-1} basis. The collected litter sample were analyzed for nutrient content (NPK and carbon) by standard methods.

Result and Discussion

Total Nutrient Content in Index Leaf of Mango Plant and litter fall

Mean total carbon nitrogen, phosphorus, and potassium content in index leaf of mango plant of Pargaon, Sawargaon and Nimone soil series

The average value of total carbon, nitrogen, phosphorus and potassium in index leaf tissue of mango plants grown in different soil series was showed in Table 1. The highest value of total C, N, P, and K in leaf tissue was associated with mango grown in Nimone soil series (38.77, 2.59, 0.93 and 1.68% respectively) followed by Sawargaon soil series for total C, N, P, and K in leaf tissue (38.58, 245.00, 0.90 and 1.60% respectively). However, numerically lowest value of total C, N, P, and K in leaf tissue was recorded in leaf tissue of mango grown in Pargaon soil series (37.21, 2.17, 0.85 and 1.43% respectively).

Table 1: Total carbon and nutrients content in index leaf tissue of mango plant

Particular Soil series	Concentration of Plant Carbon and Nutrients (%)			
	Carbon	Nitrogen	Phosphorus	Potassium
Entisols	37.21	2.17	0.85	1.43
Inceptisols	38.77	2.45	0.90	1.60
Vertisols	38.58	2.59	0.93	1.68
Mean	38.19	2.40	0.89	1.57

Litter fall

Carbon flux through litter fall is a major pathway that brings in dead organic matter and many nutrients there in from the aerial plant parts to the surface of the soil. The overall mean value of litter fall biomass of all tree species was 0.80 t ha^{-1}, 1.05 t ha^{-1} and 0.84 t ha^{-1} for mango tree grown in Pargaon, Sawargaon and Nimone soil series. The different pattern of litter falls in monthly interval which is evident from Table-3. Numerically highest nitrogen, phosphorus, potassium and carbon content were recorded in litter fall of mango plantation under Sawargaon soil series.

On another hand carbon and nitrogen are most important of many element required for microbial decomposition of organic matter. The result revealed that numerically optimum C: N ratio (31.68) was recorded in litter leaf fall of mango plant under Sawargaon soil series as compare to other series. It was suggested that the range of C: N ratio was best to stimulate release of nutrient to crop.

Nutrient return to the soil through litter fall of mango plants in Pargaon, Sawargaon and Nimone soil series

Data pertaining to nutrient return to soil through litter fall of mango plants as influenced by different soil series are presented in Table 2. Where seasonal variations in nutritional element returns are seen. Nutrient returns through litter fall of mango plants are higher in the rainy to winter season. The result revealed that numerically maximum return of nitrogen, phosphorus and potassium content through litter fall was recorded in Sawargaon soil series (16.87, 4.68 and 9.73 g m^{-2} $year^{-1}$) as compare to other soil series.

Table 2: Nutrient return to soil through litter fall of mango plants

Particular Soil series	Nutrients (g m^{-2} $year^{-1}$)		
	Nitrogen	Phosphorus	Potassium
Pargaon (Entisol)	14.29	3.09	6.52
Sawargaon (Inceptisol)	16.87	4.68	9.43
Nimone (Vertisol)	4.37*	1.97*	3.07*

* Nutrient return to soil in Nimone soil series is (g /m2/ 4 month)

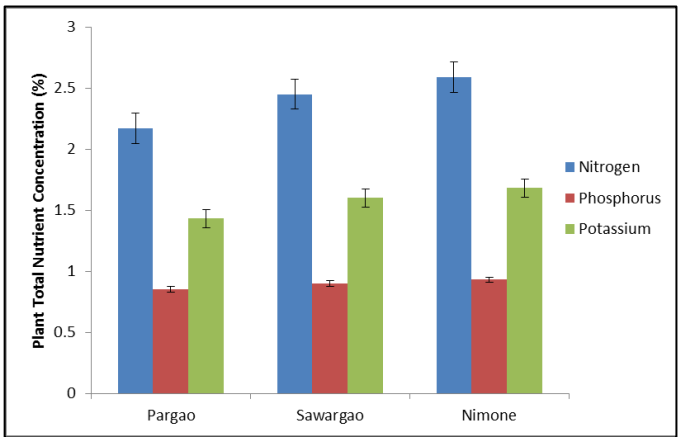

Fig 1: Mean total nitrogen, phosphorus, and potassium content in index leaf of mango plant of Pargaon, Sawargaon and Nimone soil series.

Table 3: Mean of litter biomass, nitrogen, phosphorus, potassium and carbon content in leafs litter of mango tree as influenced by various land use system in Pargaon, Sawargaon and Nimone soil series

Soil Series / Months	Pargaon					Sawargaon					Nimone				
	Litter biomass (t ha^{-1})	Litter N%	Litter P%	Litter K%	Litter C%	Litter biomass (t ha^{-1})	Litter N%	Litter P%	Litter K%	Litter C%	Litter biomass (t ha^{-1})	Litter N%	Litter P%	Litter K%	Litter C%
March	0.42	1.34	0.27	0.58	32.58	0.41	1.05	0.32	0.80	46.28	*	*	*	*	*
April	0.49	1.68	0.26	0.75	49.80	0.51	1.54	0.33	0.93	46.68	*	*	*	*	*
May	0.55	1.51	0.31	0.53	47.49	0.52	0.91	0.31	0.55	45.66	*	*	*	*	*
June	0.43	1.85	0.25	0.50	48.94	0.48	1.54	0.31	0.58	47.50	*	*	*	*	*
July	0.50	1.34	0.31	0.63	48.16	0.50	0.98	0.30	0.60	46.70	*	*	*	*	*
August	0.76	0.84	0.33	0.63	45.92	0.84	0.49	0.31	0.78	45.63	*	*	*	*	*
September	0.85	1.01	0.34	0.45	49.01	1.21	0.70	0.38	0.50	44.22	*	*	*	*	*
October	1.77	1.34	0.40	0.63	48.98	1.67	1.54	0.42	0.73	44.35	*	*	*	*	*
November	1.61	1.68	0.25	0.68	49.81	1.64	1.54	0.37	0.68	49.74	1.76	1.61	0.35	0.83	44.83
December	1.69	1.18	0.28	0.75	49.17	1.73	1.33	0.32	0.83	44.77	1.91	1.12	0.70	0.90	42.23
January	0.46	2.02	0.25	0.75	49.14	0.50	1.75	0.31	0.90	45.80	0.54	0.63	0.48	0.83	45.56
February	0.49	1.85	0.27	0.63	48.76	0.54	1.47	0.31	0.45	45.08	0.59	1.47	0.67	0.93	43.89
General Mean	0.80	1.25	0.29	0.64	45.66	1.05	1.49	0.51	0.82	47.21	0.84	1.20	0.33	0.69	43.63

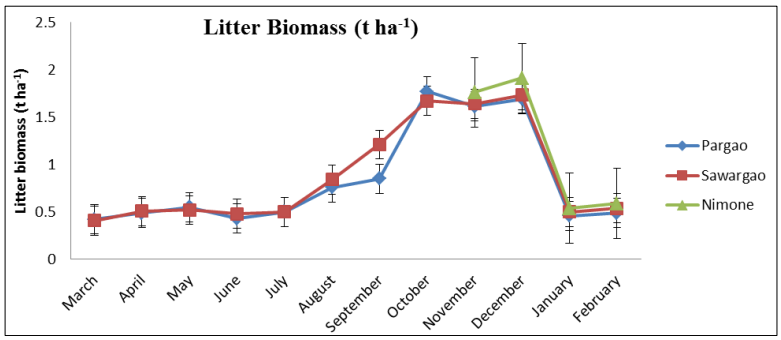

Fig 2: Mean of litter biomass in leaf litter of mango tree as influenced by various land use system in Pargaon, Sawargaon and Nimone soil series

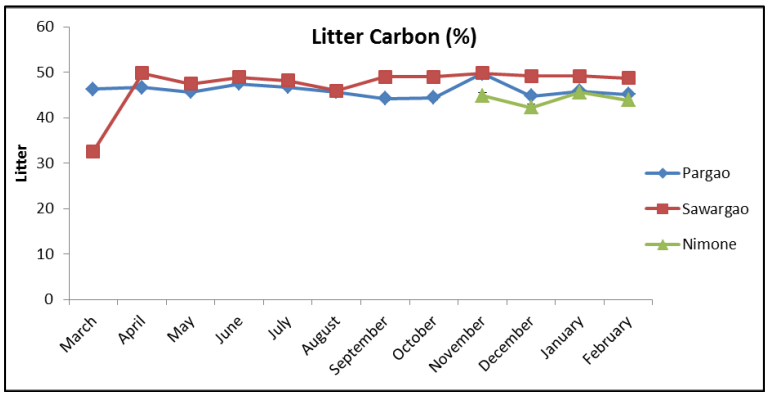

Table 3: Mean carbon content in leaf litter of mango tree as influenced by various land use system in Pargaon, Sawargaon and Nimone soil series

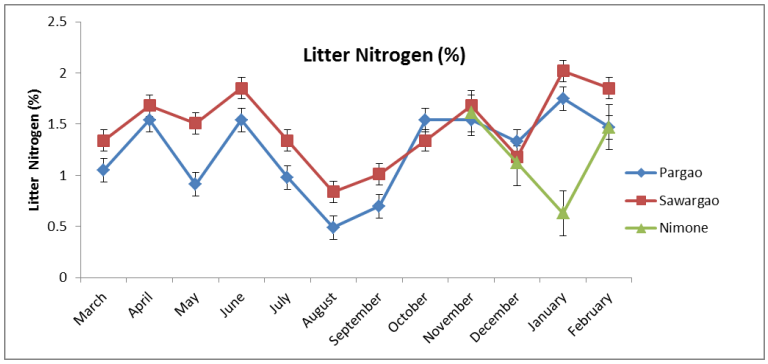

Fig 4: Mean nitrogen content in leaf litter of mango tree as influenced by various land use system in Pargaon, Sawargaon and Nimone soil series

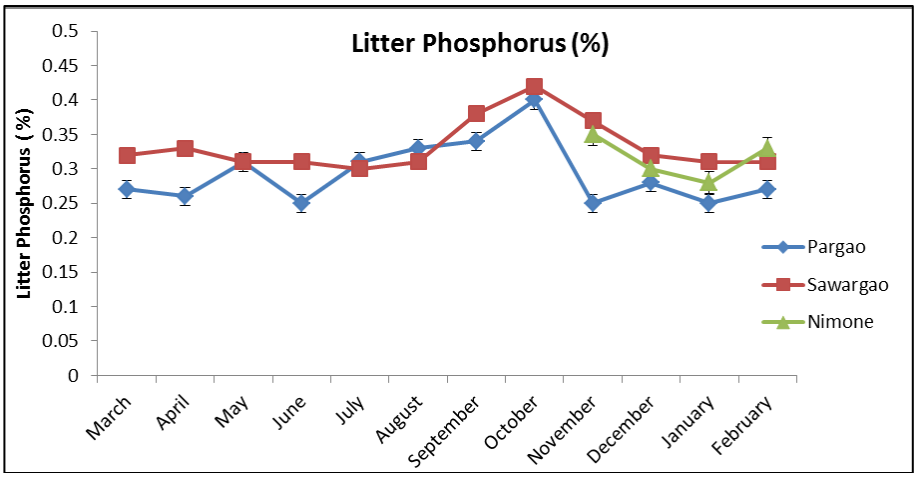

Fig 5: Mean phosphorus content in leaf litter of mango tree as influenced by various land use system in Pargaon, Sawargaon and Nimone soil series

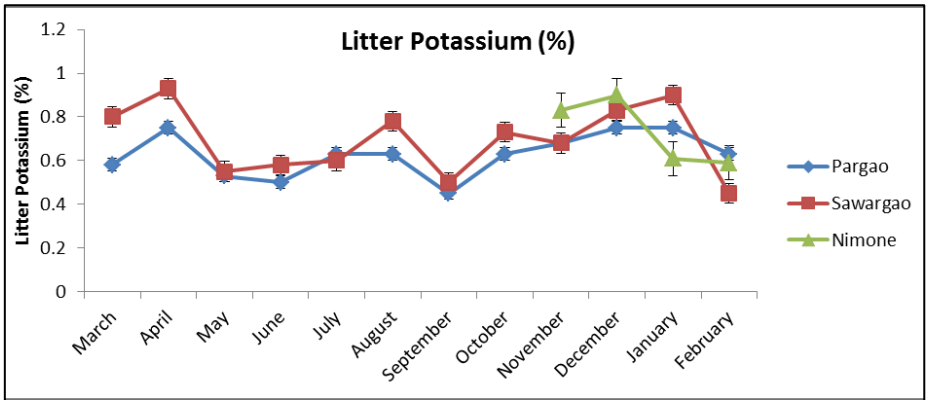

Fig 6: Mean Potassium content in leaf litter of mango tree as influenced by various land use system in Pargaon, Sawargaon and Nimone soil series

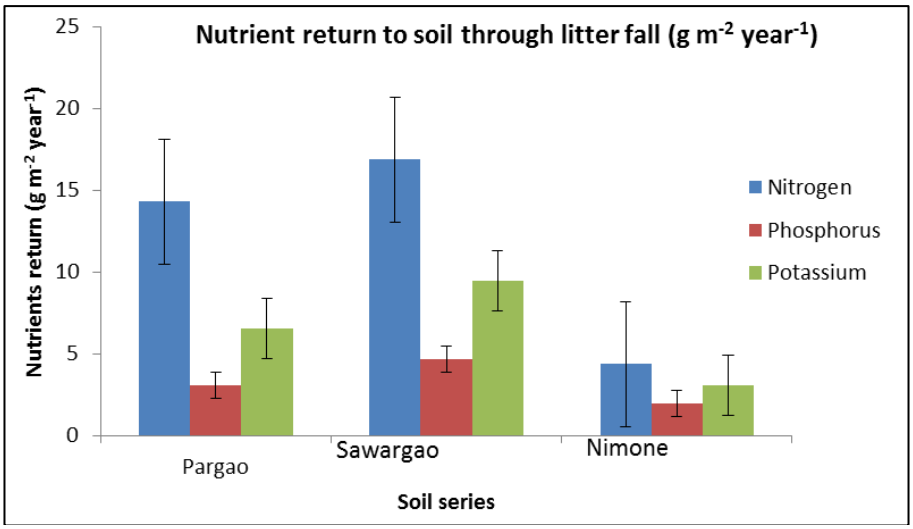

Fig 7: Nutrient return to the soil through litter fall of mango plants in Pargaon, Sawargaon and Nimone soil series

Conclusion

In present study, the monthly litterfall of mango tree were showed seasonal variation in biomass and nutrient content. Nutrient returns through litter fall of mango plants are higher in the rainy to winter season. The result revealed that numerically maximum return of nitrogen, phosphorus and potassium content through litter fall was recorded in Sawargaon soil series (16.87, 4.68 and 9.73 gm^{-2} $year^{-1}$) as compare to other soil series. The result revealed that numerically optimum C: N ratio (31.68) was recorded in litter leaf fall of mango plant under Sawargaon soil series as compare to other series. It was suggested that the range of C: N ratio was best to stimulate release of nutrient to crop.

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