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Dry matter accumulation, yield and nutrient uptake by *rabi* maize (*Zea mays* L.) under different weed management practices and soil residual nutrient

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Abstract
A field experiment was conducted at Central Research Station of the College of Agriculture, OUAT, Bhubaneswar, during two consecutive *kharif* and *rabi* seasons of 2017-18 and 2018-19. Maize crop was taken as *rabi* crop after the *kharif* rice to study the influence of residual nutrient provided to rice and direct effects of different weed management practices on its growth, yield attributes, yield and nutrient uptake. Among the nutrient management practices, 50% STBN + 50% VC (*i.e.* 50% soil test based nitrogen and 50% nitrogen was supplied through vermicompost) recorded the highest dry matter accumulation (1442 g/m^2), kernel yield (6.36 t/ha), and NPK uptake by succeeding maize crop. Among the weed management practices, combined application of topramezone @25g *a.i.* + atrazine @ 250g *a.i.*/ha as tank mix resulted the maximum kernel yield 7.18 t/ha. With respect to the total nutrients (NPK) uptake, treatment comprising 50%STBN + 50%VC recorded highest total nutrient uptake *i.e* 111.7Kg/ha nitrogen (75 Kg in kernel+36.7 Kg in stover), 40.7 Kg/ha phosphorus (30.5 Kg in kernel+10.2 Kg in stover) and 137 Kg/ha potassium (35 Kg in kernel+102 Kg in stover). Among the weed management practices, treatment comprising Topramezone @25g *a.i.* + Atrazine @ 250g *a.i.*/ha as tank mix recorded highest value of nutrient uptake, 127.9 Kg/ha nitrogen, 46.2 Kg/ha phosphorus and 152 Kg/ha potassium. Weedy check recorded minimum nutrient uptake of 51.7-15.9-71 Kg/ha nitrogen phosphorus and potassium respectively.

Keywords: STBN- soil test based nitrogen, vc-vermicompost, topramezone, tembotrione, atrazine, nutrient uptake

Introduction
Maize (*Zea mays* L.) is the most versatile and emerging food crop of global importance. Maize is known to be very responsive to better management. Among the growth inputs mineral nutrition also plays a vital role in maize production. Well balanced nutrient dose is very much essential to achieve the desired yield and economic benefit of maize. Weed is another factor that constitutes a major problem in harnessing yield potential of maize. Nutrition losses caused by weeds can be effectively tackled either by effective weed management or through the use of higher fertilizer or combination of both. Keeping this in view, present investigation was carried out to study the effect of residual nutrients and weed management practices on growth, yield and nutrient uptake in *rabi* maize.

Literature in support
Mundra *et al.* (2002) [9] found that The yield as well as uptake of N and P by the crop were maximum with 150% recommended dose of N and P through fertilizer, followed by 125% recommended dose of fertilizer while the uptake of N and P were comparatively higher with the treatments involving application of FYM 10 tonnes/ha compared to remaining treatment of nutrient management.
Ashoka *et al.* (2011) [1] observed that higher uptake of nutrients *viz*., nitrogen (183.10 kg/ha), phosphorus (71.41 kg/ha), potassium (1693.84 kg/ha), zinc (413.8 g/ha) and iron (3023.2 g/ha) were recorded with application of RDF+25 kg ZnSO 4+10 kg FeSO 4+35 kg vermicompost over RDF (150-60-40 kg NPK ha^{-1}) alone.
Vidyavathi *et al.* (2012) [15] in a four years long term field experiment (LTFE) observed that the nutrient management practices had significant effect on soil fertility status. The available N, P_2O_5, K_2O and S showed build up in soil over four years under both organic and integrated nutrient management practices. At the end of third year of LTFE the available N, P_2O_5, K_2O and S was significantly influenced by integrated nutrient management practice.

Deewan *et al.* (2018) [4] concluded that pre-emergence application of 0.15 kg oxyfluorfen / ha in conjugation with hoeing 30 DAS resulted in highest nutrient uptake by crop as well as the highest yield of quality protein maize. Under nutrient management treatments, 125% RDF (150 kg N and 50 kg P_2O_5) may be applied for maximization of nutrient uptake by crop and thereby yield.

Chhetri and Sinha (2019) [3] reported that among the nutrient management practices highest N, P and K uptake in maize was recorded with treatment receiving 75% RDF + PSB + *Azotobacter* + vermicompost (VC) @ 5.0 t ha^{-1} followed by 100% RDF + PSB + *Azotobacter*, 100% RDF and the lowest N, P and K uptake was observed under 50% RDF +PSB+ *Azotobacter* + 50% vermicompost 2.5 t ha^{-1}. Similarly Nanjappa *et al.* (2001) [10] and Meena *et al.* (2006) [8] also established the fact that uptake of N, P and K by maize was found higher due to application of 75% recommended dose of fertilizer and 2.7 t ha^{-1} vermicompost.

Sandhya rani *et al.* (2020) [2] reported higher nutrient up take by maize at 80 DAS, kernel and stover yield was recorded with hand weeding twice at 15 and 30 DAS, which was statistically at par with atrazine @1.0 kg ha^{-1} as PE *fb* topramezone @30g ha^{-1} or tembotrione @120g ha^{-1} as PoE or atrazine @1.0 kg ha^{-1} as PE *fb* HW at 30 DAS, while these were lowest with weedy check.

Material and Methods

A two year field experiment was conducted during 2017-18 and 2018-19 at Central Research Station of the College of Agriculture, OUAT-Bhubaneswar, with the title "Integrated nutrient management in rice and its residual effects on maize under different weed management practices". The soil of the experimental plot was loamy sand in texture, low in available nitrogen (198 kg/ha), high in available phosphorus (51 kg/ha) and low in available potassium (182 kg/ha), organic carbon 0.46% and pH (4.68), EC dsm^{-1} (0.46). The field experiment was laid out in a split-plot design for maize with three replications. The four nutrient management practices given to rice *viz*, D1=100% STBN, D2=50%STBN+50%FYM, D3=50%STBN+50%VC and D4=50%STBN+50%PM were taken as the main plot factors and different weed management practices were given to maize as the sub-plot factors such as W1= Topramezone @25g *a.i*/ha, W2=Tembotrione @105g *a.i.*/ha, W3=Topramezone @25g *a.i.* + Atrazine @ 250g *a.i.*/ha as tank mix, W4=Tembotrione @105g *a.i.*+Atrazine @ 250g *a.i.*/ha and W5=Weedy check. Maize was sown with spacing of 45cm×25cm on opening of shallow furrows of 5 cm deep and was provided with recommend dose of fertilizer (RDF) of 120-60-60: N-P_2O_5-K_2O kg ha^{-1}. Nutrient demand of maize was provided through Urea, Single Super Phosphate and Murate of Potash. Herbicides in maize were applied at 15 DAS. The yield of maize was recorded after harvest of the crop for all the treatment and data was analysed in statistical split plot design. Nutritional content in maize both in kernel and stover was analysed in the laboratory. The nutrient content in grain and straw obtained from plant analysis was multiplied with the component of plant to get the nutrient uptake in kg/ha.

Results and Discussion

Dry matter accumulation

Dry matter accumulation in maize progressively increased up to harvest. The data of dry matter accumulation at harvest stage has been presented in Table 1. Both nutrient management and weed management practices found to have significant impact on dry matter production of maize. Maximum amount of dry matter production was observed in the treatments receiving nutrients both from organic and inorganic sources in the previous crop *i.e* 50%STBN+50% VC (1445.2g/m^2), 50% STBN+50% PM (1334.8g/m^2) and 50% STBN+50% PM (1269.2 g/m^2). A comparative lower value of dry matter production 1143.5g/m^2 was observed when nutrient source was applied through only chemical fertilizer. This implied that soil residual fertility build up under both organic and integrated nutrient management practices and which enhance the availability of nutrient elements for the succeeding crops [15].

Among the weed management practices, application of topramezone @25g *a.i.* + atrazine @ 250g *a.i.*/ha as tank mix caused highest dry matter accumulation of 1469.9 g/m^2. Which was significantly higher than the dry matter accumulation of rest of the weed management practices. Lowest dry matter accumulation of 947.4 g/m^2 was recorded in weedy check. Application of all the herbicidal treatments in maize was effective in suppressing weeds and thus providing a better environment for the growth and better dry matter production [13, 14].

Yield

Nutrient management found to be significantly influence the kernel yield of maize. Among the nutrient management practices highest kernel yield and stover yield were recorded in 50% STBN + 50% VC *i.e.* 6.36 t/ha and 7.80 t/ha respectively. The kernel yield was found to increase between 8-10% when maize crop was taken on residual nutrients of organic nutrients compared to sole inorganic nutrients. This was ascribed to continuous supply of N, P and K throughout the crop growth periods as the nutrients from chemical sources were available to the crop in the early stages and in the later stages it gradually slowed down [7, 15].

All the weed control methods resulted significant increase in grain and biological yield over weedy check. This might be due to fact that all these herbicidal weed control treatment gave almost season-long control of weeds obviously due to their persistence in soil for a sufficiently long time and broad spectrum control of weeds. The results are in conformity with those reported by Ram *et al.,* (2003) and Birendra *et al.,* (2017). Among the practices, best weed management practices in terms of kernel yield (7.18 t/ha) was found in case of combined application of topramezone @25g *a.i.* + atrazine @ 250g *a.i.*/ha as tank mix followed by 6.91 t/ha in tembotrione @105g *a.i.*/ha +Atrazine @ 250g *a.i.*/ha as tank mix at 15 DAS. Weedy check recorded least value of kernel yield (2.77 t/ha).

Nutrient uptake of maize

N and K uptake either by maize kernel or stover did not find to be significantly influence with nutrient management practices. However nutrient management practices had significant influence over the phosphorus uptake of both kernel as well as stover. Residual effect of 50% STBN + 50% VC exhibited maximum phosphorus uptake by maize of 30.5 Kg/ha by kernel and 10.1 Kg/ha by stover. Total nitrogen uptake by maize ranged between 98.7 Kg/ha to 111.7 Kg/ha. Total phosphorus uptake of 40.7 Kg/ha was observed for 50% STBN + 50% VC. Which was at par with total phosphorus uptake (37.8 Kg/ha) in 50% STBN + 50%PM. Total potassium uptake by maize ranged between 126-137 Kg/ha.

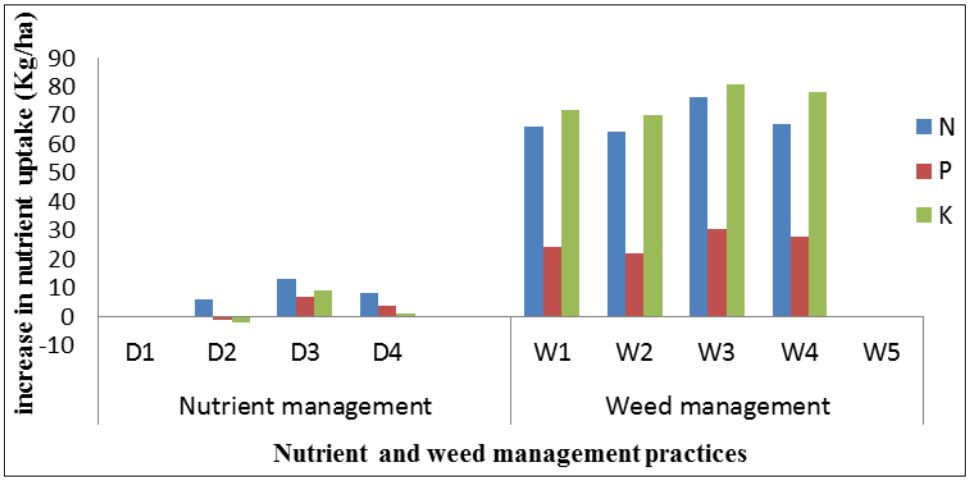
The nutrient uptake by a crop are mainly the function of crop yield and the nutrient content in plant parts. Therefore, considerable increase in NPK uptake by the crop is attributed to higher grain and stover yield at higher fertility level. Sathish *et al.* (2011) also reported that higher NPK uptake was achieved in maize when there was combined application of inorganic and organic nutrient sources either from FYM or Paddy straw in rice- maize sequence.

Graph-1 represents the increase in total nutrient uptake by maize. For nutrient management practices 100% STBN and for weed management practices weedy check values were taken as reference.

Weed management practices were found to be greatly influence the indivisual NPK uptake by both kernel and stover as well as the total NPK uptake. Among the treatments, topramezone @25g *a.i.* + atrazine @ 250g *a.i.*/ha as tank mix recorded highest total nitrogen uptake of with total uptake of 127.9 Kg/ha (85.4 Kg/ha by kernel and 42.5 Kg/ha by stover). Which was at par with other herbicidal treatments. Total phosphorus uptake by weed management practices varied between 15.9 Kg/ha and 46.2 Kg/ha. Both the treatments *i.e.* topramezone @25g *a.i.* + atrazine @ 250g *a.i.*/ha as tank mix and W4= tembotrione @25g *a.i.* + atrazine @ 250g *a.i.*/ha as tank mix were equally at par with respect to total phosphorus uptake. Maximum value of potassium uptake of 152 Kg/ha was recorded in treatment combination of topramezone @25g *a.i.* + atrazine @ 250g *a.i.*/ha as tank mix and this was significantly at par with the remaining herbicidal treatments. A significantly lower total nitrogen uptake (51.7 Kg/ha). phosphorus uptake (15.9 Kg/ha) and potassium uptake (71 Kg/ha) was recorded for weedy check.

The effective weed control by these herbicidal treatments provided a competition free environment and improved physical, biological condition of the soil, which led to increased growth of crop and thereby increase in the biological yield and by increasing the nutrient uptake of maize Similar findings also reported by Swetha *et al.* (2015) and Birendra Kumar (2017).

This might be due to lower weed dry matter because of higher weed control efficiency with these treatments resulting in more favourable environment for growth and development of crop plant. Similar results also confirmed by the findings of Swetha *et al.* (2015).



Graph 1: Increase in total nutrient uptake by maze as influenced by nutrient and weed management practices over the lowest value recorded

Table 1: Effects of nutrient and weed management on nutrient uptake by maize (pooled over 2 years)

Treatment	Dry matter accumulation of maize at harvest (g/m^2)			Nutrient uptake (Kg/ha)								
				Kernel			Stover			Total		
	2017	2018	Pooled	N	P	K	N	P	K	N	P	K
Nutrient Management												
100% STBN	1173.0	1113.9	1143.5	64.6	25.6	30.1	34.1	8.3	97.0	98.7	34.0	128
50%STBN+50%FYM	1310.1	1228.4	1269.2	70.9	26.1	30.9	33.8	6.8	95.5	104.7	32.8	126
50%STBN+50% VC	1506.9	1383.5	1445.2	75.0	30.5	35.0	36.7	10.2	102.2	111.7	40.7	137
50% STBN+50%PM	1395.2	1274.3	1334.8	72.2	28.8	33.0	34.5	9.0	96.0	106.7	37.8	129
S.Em±	37.3	39.9	27.3	3.31	1.31	1.64	2.17	0.79	2.89	0.02	2.02	4.87
CD (0.05)	129.3	138.2	84.2	NS	2.93	NS	NS	2.56	NS	NS	3.53	NS
Weed Management												
Topramezone	1414.8	1328.9	1371.8	78.9	31.0	36.4	39.0	9.1	107.0	117.8	40.1	143
Tembotrione	1319.3	1284.0	1301.7	76.5	29.4	34.7	39.5	8.2	106.2	116.0	37.7	141
Topramezone+Atrazine	1527.7	1412.1	1469.9	85.4	35.2	40.9	42.5	11.1	111.4	127.9	46.2	152
Tembotrione+Atrazine	1474.7	1325.3	1400.0	81.5	32.5	38.7	37.3	11.0	110.3	118.9	43.5	149
Weedy check	995.0	899.8	947.4	32.4	11.9	14.1	19.3	4.0	56.5	51.7	15.9	71
S.Em±	73.3	52.8	45.2	5.24	1.24	1.56	2.7	1.18	3.97	0.04	0.04	4.04
CD (0.05)	209.9	151.4	152.6	10.18	2.18	2.36	4.84	2.84	6.47	12.95	3.95	13.9
Interaction Non significant												

Conclusion

The findings of the present investigation conclusively inferred that for when maize crop was grown in residual nutrients of rice crop provided through organic+inorganic sources *viz.* 50% STBN + 50% VC, 50% STBN + 50% FYM and 50% STBN + 50%PM and post emergence application of

topramezone@25g *a.i.* + atrazine @ 250g *a.i.*/ha as tank mix or post emergence application of tembotrione@110g *a.i.* + atrazine@ 250g *a.i.*/ha as tank mix at 15 DAS performed superior in terms of higher dry matter accumulation, yield and nutrient (NPK) uptake by crop over sole inorganic sources (100% STBN) and sole application of topramezone and tembotrione.

References

1. Ashoka P, Giriyappa M, Sunitha NH. Effect of different nutrient management practices on yield, economics and nutrient uptake of baby corn (*Zea mays* L.). *Research on Crops* 2011;12(2):368-37.
2. Sandhya Rani B, Chandrika V, Prabhakara G, Reddy P, Sudhakar KV, Nagamadhuri *et al*. Weed dynamics and nutrient uptake of maize as influenced by different weed management practices. Indian journal of Agricultural research. 2020. DOI: 10.18805.
3. Chhetri B, Sinha AC. Moisture conservation and nutrient management practiceson growth and yield of maize. Current agriculture research journal 2019;7(3).
4. Deewan P, Mundra SL, Trivedi J, Meena RH, Verma R. Nutrient uptake in maize under different weed and nutrient management options. Indian Journal of Weed Science 2018;50(3):278-281.
5. Ghosh D, Brahmachari K, Brestic M, Ondrisik P, Hossain A, Skalicky M *et al*. Integrated Weed and Nutrient Management Improve Yield, Nutrient Uptake and Economics of Maize in the Rice-Maize Cropping System of Eastern India. Agronomy. 2020;10:1906; doi:10.3390/agronomy10121906.
6. Kumar B, Prasad S, Mandal D, Kumar R. Influence of Integrated Weed Management Practices on Weed Dynamics, Productivity and Nutrient Uptake of Rabi Maize (Zea mays L.). Int. J. Curr. Microbiol. App. Sci 2017;6(4): 1431-1440.
7. Lokose RYP. Weed and nutrient management in maize (*Zea mays* L.) and cowpea (*Vigna unguiculata* L.*)* intercropping and residual effects on sesame (*Sesamum indicum* L.) Ph.D. thesis submitted to department of agronomy, ouat, Bhubaneswar, Odisha, India 2017.
8. Meena O, Khafi HR, Shekh MA, Mehta AC, Davda BK. Response of *rabi* maize (*Zea mays* L.) to vermicompost and nitrogen levels. Research on Crops 2006;8(1):93-94.
9. Mundra SL, Vyas AK, Maliwal PL. Effect of weed and nutrient management on nutrient uptake by maize (Zea mays) and weeds. Indian Journal of Agronomy 2002;47(3):378-383.
10. Nanjappa HV, Ramachandrappa BK, Mallikarjun BO. Effect of integrated nutrient management on yield and nutrient balance in maize (*Zea mays*). Indian Journal of Agronomy. 46(4):698-701.
11. Ram B, Choudhary AS, Jat AS, Jat ML. Effect of integrated weed management and intercropping systems on growth and yield of pearlmillet (Pennisetum glaucum). Indian journal of agronomy 2003;48(4):254-56.
12. Rana SS, Badiyala D, Sharma N, Kumar R, Pathania P. Impact of Tembotrione on Weed Growth, Yield and Economics of Maize (*Zea mays* L.) under Mid Hill Conditions of Himachal Pradesh. Pesticide Research Journal 2017;29(1):27-34.
13. Swetha K, Madhavi M, Pratibha G, Ramprakash T. Weed management with new generation herbicides in maize. Indian Journal of Weed Science 2015;47(4):432-433.
14. Triveni U, Sandhya Rani Y, Patro TSSK, Bharathalakshmi M. Effect of different pre- and post-emergence herbicides on weed control, productivity and economics of maize. Indian Journal of Weed Science 2017;49(3):231-235 2017. DOI: 10.5958/0974-8164.2017.00061.
15. Vidyavathi, Dasog GS, Babalad HB, Hebsur NS, Gali SK, Patil SG, Alagawadi AR. Nutrient status of soil under different nutrient and crop management practices. Karnataka Journal of Agricultural Science. 2012;25(2):193-198.