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Drymatter production and nutrient uptake as influenced by mepiquatchloride in potato

V. RAVIKUMAR, K. SATHIYABAMA AND R. JAYAKUMAR
Dept of Soil Science & Agrl. Chemistry, Tamil Nadu Agrl. Univ., Coimbatore - 641 003, Tamil Nadu

Abstract : **Field experiments were conducted during 1997-98 at wood house farm, Udhagamandalam to study the effect of mepiquatchloride (MC) at different concentration from 50 to 250 g ai ha^{-1} compared along with pesticides, water spray and control. Plant samples were collected at 60 and 90 DAS and at harvest and analyzed for N, P and K contents. The results indicated that, foliar application of MC at 45 DAS recorded increased Total dry matter production (TDMP), nutrient content and uptake in the treatment of MC at 62.5 g ai ha^{-1} alone or in combination with endosulfan and mancozeb.**

Key words: Mepiquatchloride, TDMP-Nutrient uptake, Potato.

Introduction

Nutrient uptake by any crop is a function of the dry matter, and nutrient concentration. The plant growth regulators are proved to increase the dry matter production (DMP) through vegetative growth and nutrient absorption through expanded root system. In potato, increased nitrogen (N) concentration was observed when gibbrelic acid(GA) or naphthalene acetic acid (NAA) was applied at lower concentration. The higher rate of mepiquatchloride (MC) seed treatment resulted in greater concentration of Ca, P and N in plant leaves, stems and also greater concentration of Mg, P and N in roots of cotton plants than in control (Zhang *et al.* 1990). Kumar and Palani (1991) found that application of the commercial plant growth regulator Biozyme crop plus (BCP) at 50 ppm had shown significantly higher N, K, Ca and Mg contents than the control plots. Increased total uptake of N, P, K, Na , Ca and Mg by application of Terpal (MC + ethephon) and in field bean plants at the 2 to 4 leaf stage was reported by Nowak *et al.* (1998).

Increase in the economic yield of crops was attributed to higher dry matter accumulation. To improve the productivity regulating plant

Table 1. Effect of MC on total dry matter production (t ha^{-1}) at different stages of crop growth

Treatments	60 DAS		90 DAS		Harvest	
	I crop (1997)	II crop (1998)	I crop (1997)	II crop (1998)	I crop (1997)	II crop (1998)
T_1- MC 50 g ai ha^{-1}	3.18	3.13	5.36	5.01	8.24	7.37
T_2- MC 62.5 ga ha^{-1}	3.36	3.27	5.47	5.10	8.33	7.44
T_3- MC 75 g ai ha^{-1}	3.14	3.15	5.37	5.00	8.26	7.38
T_4- MC 125 g ai ha^{-1}	2.80	2.86	4.88	4.78	7.81	7.00
T_5- MC 250g ai ha^{-1}	2.52	2.59	4.63	4.56	7.51	6.83
T_6 - T_3+ endosulfan	3.34	3.25	5.45	5.08	8.32	7.51
T_7 - T_3+ mancozeb	3.29	3.22	5.41	5.08	8.31	7.39
T_8 - Cycocel	3.14	3.14	5.27	5.05	8.22	7.35
T_9 - Water spray	2.51	2.24	4.84	4.59	7.61	6.75
T_{10} - control	2.31	2.17	4.64	4.48	7.55	6.72
SEd	0.12	0.12	0.12	0.06	0.18	0.14
CD (p=0.05)	0.24	0.24	0.25	0.13	0.38	0.30

Table 2. Effect of MC on uptake of major nutrients in potato at different growth stages

Treat-ments	N						P						K					
	60 DAS		90 DAS		Harvest		60 DAS		90 DAS		Harvest		60 DAS		90 DAS		Harvest	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
T_1	77.6	73.6	142.5	133.6	183.4	152.0	7.41	7.40	14.1	12.9	13.4	11.5	90.0	88.4	170.3	154.1	197.7	155.5
T_2	86.0	79.4	156.4	150.8	190.1	160.4	8.58	8.42	15.9	14.2	14.3	12.1	98.1	95.	183.0	170.1	208.6	163.9
T_3	75.4	73.2	141.1	134.6	183.4	153.4	7.25	7.49	14.4	13.1	13.7	11.9	88.3	87.9	170.4	153.5	199.2	153.7
T_4	62.2	89.9	117.4	116.0	153.2	126.8	6.29	6.38	12.5	12.1	11.6	10.5	68.9	71.2	149.3	138.1	173.3	138.9
T_5	55.6	52.3	108.2	106.5	143.6	117.7	5.40	5.52	11.6	11.1	10.5	8.27	59.5	61.4	139.5	128.5	164.5	125.0
T_6	85.3	76.5	149.3	147.6	188.9	161.6	8.42	8.15	15.7	14.2	14.6	12.9	96.9	93.1	182.5	167.2	204.8	164.5
T_7	80.6	74.2	146.8	145.9	184.4	158.1	7.95	8.02	15.5	14.2	13.8	12.2	93.4	91.0	174.4	165.7	200.7	158.4
T_8	76.8	70.6	139.3	137.0	180.7	150.3	7.49	7.54	14.6	13.6	13.7	12.0	88.1	88.5	170.6	160.3	197.1	154.5
T_9	54.8	44.8	112.4	106.3	149.4	112.4	5.33	4.76	11.8	10.6	10.8	8.16	57.9	52.9	144.3	128.9	164.4	124.6
T_{10}	48.8	41.5	105.8	101.7	138.1	109.6	4.75	4.45	10.6	9.61	10.2	7.44	51.8	50.2	130.3	120.9	160.8	122.4
SEd	0.07	0.05	6.17	4.13	4.68	4.04	0.39	0.29	0.39	0.50	0.36	0.64	4.99	3.44	5.61	4.11	6.09	3.77
CD (P=0.05)	0.15	0.10	12.9	8.68	9.76	9.25	0.89	0.62	0.81	1.04	0.76	1.34	10.0	7.22	11.8	8.63	12.8	7.43

I and II denote the first and second seasons respectively

growth is one way which may be achieved by use of plant growth regulators. Kulkarni *et al.* (1995) reported that MC at 100 ppm had showed significantly higher dry weight of the stem in sunflower crop. Chandrababu *et al.* (1995) observed that MC at 125 ppm was sprayed at 70 DAS resulted in increased DMP in groundnut. Hence the present study was carried out to find out the biomass production and nutrient uptake by potato as influenced by MC application.

Materials and Methods

Field experiments were conducted during 1997 and 98 at wood house farm, Horticultural Research Station, Udhagamandalam, to test the effect of MC on dry matter production and nutrient uptake. The treatments constituted are dfferent doses of MC *viz.* 50 g ai ha^{-1} (T_1), 62.5 g ai ha^{-1} (T_2), 75 g ai ha^{-1} (T_3), 125 g ai ha^{-1} (T_4),250 g ai ha^{-1} (T_5), 62.5 g ai ha^{-1} + endosulfan (T_6), 62.5 g ai ha^{-1} + mancozeb(T_7), Cycocel 62.5 g ai ha^{-1} (T_8), water spray(T_9) and control(T_{10}). The soil type was loam with a pH of 4.2, EC 0.4 dSm^{-1} and organic carbon content of 18.5 mg kg^{-1} for the first crop and sandy clay loam with a pH of 4.5, EC 0.35 dSm^{-1} and organic carbon content of 21.0 mg kg^{-1} for second crop. The commercial formulation of MC containing 5 per cent Aqueous solution (AS) supplied by M/s. Gharda chemicals Ltd, Mumbai was applied on 45 DAS (days after sowing) as per the treatment schedule. The TDMP was recorded at 60, 90 DAS and at harvest time. Haulms were collected from each plot and fresh weights were recorded. Fresh chopped materials were dried at 80°C in an oven to get per cent dry matter in haulms and dry matter yield of haulms was calculated. The content of total N, P, and K were estimated through micro kjeldahl method, vanado-molybdo phosphoric acid yellow colour method and flame photometry respectively.

Nutrient uptake was calculated by multiplying nutrient concentration in haulms or tubers with respective dry matter yield.

Results and Discussion

The total dry matter production varied significantly during 60 DAS from 2.31 (T_{10}) to 3.36 t ha^{-1} (T_2) in the first crop. In the second crop also similar results were noticed: (Table I). The TDMP of 4.64 (T_{10}) to 5.47 (T_2)and 4.48 (T_{10}) to 5.10 (T_2) t ha^{-1} were recorded at 90 DAS showed that marked influence of treatment on the TDMP in both the season among the treatments. In both the crops, the treatments T_2 registered the highest TDMP. Increased concentration of MC at T_4 and T_5 treatments recorded significantly lower TDMP than all other MC treated plots. At the harvest stage, the highest dry matter production of 8.33 (T_2) and 7.51 (T_6) t ha^{-1} was recorded. The increased amount of TDMP may be due to MC induced translocation of C assimilates and allocation of more biomass to the root sink (Daie, 1987) and also could be due to the increase in the photosynthetic capacity and efficient translocation of photosynthates under the influence of MC (Kulkarni *et al.* 1994).

Regarding nutrient uptake (Table 2) at 60 DAS, the mean N uptake in the first crop varied from 48.8 to 86.0 kg ha^{-1}. In the second season crop, higher uptake of 79.4 kg ha^{-1} in T_2 treatment was recorded. At 90 DAS, mean N uptake in the first crop varied from 105.8 to 156.5 kg ha^{-1}. The same trend was recorded in second crop. The influence of treatment on N uptake was well pronounced in both the crops. During harvest stage, T_2 registered the higher N uptake of 190.1 kg ha^{-1} in the first crop. In the second crop, the treatment T_2 with endosulfan registered the higher N uptake of 161.6 kg ha^{-1}.

With respect to P and K, MC at 62.5 g ai ha^{-1} alone or with endosulfan and mancozeb increased the P and K uptake significantly as that of N. The plants that received exogenous application of MC recorded significantly higher concentration of major nutrients and among the treatments MC at 62.5 g ai ha^{-1} alone or along with endosulfan or mancozeb was the most prominent and these treatments were on par at 60 and 90 DAS and harvest stage in both the crops. Increased nutrient concentration might be due to the ability of the plant to absorb more nutrients from the soil consequent to the improvements in root growth, better translocation of nutrients to economic and other plant parts (Nilovaskaya *et al.* 1985) The improvement in the total N, P and K uptake by the application of growth regulators might have resulted from the increased activity of roots and better modulation The nutrient uptake by the crop is a function of nutrient concentration and total dry matter production. Thus, the application of MC at 45 DAS in potato crop increased the nutrient uptake and TDMP at the MC application rate of 62.5 g ai ha^{-1} alone or with mancozeb or endosulfan and ultimately the yield increase.

References

Chandrababu, R, Manian, K., Nagarajan, M. and Ramachandran, T.K. (1995). Effect of mepiquat-chloride, on growth and yield of groundnut *Madras Agric. J.* **82**: 229 230.

Daie, J. (1987). Bio regulator enhancement of sink activity in sugar beet. *Plant Growth Regul.* **5**: 218-219.

Kumar, R.R, and Palani, N. (1991). Effect of a commercial plant growth regulator on the elemental content of tea plants. *Commun. Soil Sci. Plant Anal.*, **22**: 1581-1590.

Kulkarni, S.S., Chetti, M.B., Amaregouda, A. and Uppar, D.S. (1994). Influence of growth retardants on growth and development of sunflower *(Helianthus annus L.)* Genotypes. *Ann. Plant Physiol.*, **8**: 121-128.

Kulkarni, S.S., Chetti, M.B., Uppar, D.S. (1995). Influence of growth retardants on biochemical parameters in sunflower. *J. Maharastra Agric. Univ.* **20**: 131-135.

Nilovaskaya, N.T., Likholat, T.V., Pomelov, A.V. and Morosora, E.V. (1985). Condition for the effective use of kinetin for increasing wheat yield. *Biologiya*, **5**: 119-121.

Nowak, G.A., Wierzbowska, J., Klasa, A. and Gotkiewicz, M. (1998). Yield and macronutrient content of field bean plants growing under conditions of growth retardant and phyto, hormone application. *Plant Growth Regul. Abstr.*, **24**.

Zhang, S., Cothem, J.T. and Lorenz, E.J. (1990). Mepiquat chloride seed treatment and germination temperature effects on cotton growth nutrient partitioning and water use efficiency. *J. Plant Growth Regul.* **9**: 195-199.

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