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Influence of vermiwash on the biological productivity of marigold

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Abstract: A pot culture experiment was conducted during 1998-1999 to know the impact of Vermiwash on the growth and yield of African marigold along with other organic sprays such as cow dung extract, vermicast extract and cow's urine at the Department of Environmental Sciences, Tamil Nadu Agricultural University, Coimbatore. Observation on growth and yield parameters were taken. The results revealed that vermiwash spray enhanced the growth parameters (plant height, number of laterals, number of leaves and leaf area) and yield parameters (number of days to flowering, number of flowers per plant and flower weight). From the results it could be seen that extracts from earthworms offer a valuable resource which could be effectively exploited for increasing the production of ornamentals like marigold.

Key words : Vermiwash, Organic spray, Growth parameter, Yield parameter.

Introduction

Earthworms play a vital role in plant growth. In recent times, the commercial vermi culturists have started promoting a product called vermiwash. It is opined that this wash would have enzymes, secretions of earthworms which would stimulate the growth and yield of crops and even develop resistance in crops receiving this spray. Such a preparation would certainly have the soluble plant nutrients apart from some organic acids and mucus of earthworms and microbes. But so far there are no experimental evidences to quantify the effect of such spray. The present investigations on the effect of vermiwash on biological productivity of marigold were carried out during 1998-1999 under both laboratory and pot culture conditions at the Department of Environmental Sciences, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore.

Materials and Methods

Preparation of extracts

Preparation of vermiwash I

Vermiwash I was prepared by the method standardized at the Institute of Research and Soil Biology and Biotechnology, the New College, Chennai by Ismail (1997). A plastic tub of dimensions 100 x 100 x 100 cm was fitted with a plastic gate-valve to facilitate drainage of eluates. The tub was filled to a height of 25 cm with gravel (2-4" size) above which was placed a layer of coarse sand (30 cm) and garden soil (30 cm). Above the soil, a layer of shade dried and powdered cow dung was added. This was gently moistened with distilled water and the excess water was drained off. The unit was moistened every day (80% moisture). To this, 250 earthworm adults belonging to the species *Eudrillus enginiae* were released. After sixteen days, eluates were collected daily by slowly sprinkling five litres of distilled water from the top. The water slowly percolated through the compost and drilospheres, carrying with it nutrients from freshly formed castings, as well as washings from the drilospheres through the filter unit. Then the eluates collected were stored at 4°C and used for assessing the biological productivity.

Preparation of vermiwash II

Vermiwash II was prepared to get the benefits of the secretions of body fluids of the earthworm, following the method of Kale (1998). One kg adult earthworms (approximately numbering 1000 worms) of the same species (*E.euginiae*) were collected and without any mixing of the casts, they were released into

Table 1. Characteristics of organic extracts*

Extract	pH	EC (dSm^{-1})	Organic carbon (per cent)	Total nitrogen ($mg\ l^{-1}$)	Total phosphorus ($mg\ l^{-1}$)	Total potash ($mg\ l^{-1}$)	Sodium ($mg\ l^{-1}$)	Calcium ($mg\ l^{-1}$)	Magnesium l^{-1})	IAA (ppm)
Vermiwash I	7.52	1.10	0.009	61.02	18.20	55.20	120.10	178.60	198.00	15.02
Vermiwash II	7.98	0.56	0.042	55.00	19.15	46.24	119.40	181.08	196.34	16.08
Vermicast	7.35	0.53	0.380	64.00	21.60	48.30	125.80	174.60	194.60	18.20
Cow dung	7.23	0.64	0.330	58.20	18.20	46.10	115.30	162.36	158.10	38.06
Cow urine	7.94	8.26	0.660	62.12	17.30	42.00	116.24	153.30	142.02	12.20

* Mean of four replications

a through containing 500 ml of lukewarm distilled wate (37°C - 40°C) and agitated for two minutes. Earthworm were taken out and again washed in another 500 ml a room temperature (±30°C) and released back into the tank. The agitation in lukewarm water made the earthworms t release sufficient quantities of mucus and body fluids. Transferrin into ordinary water was to wash the mucus sticking sti on to their body surface and this also helped the earthworm to revive from the shock.

Preparation of vermicast extract

Vermicast was collected from worm beds and shad dried for one day. Five hundred g of the dried cast wa put into a muslin cloth bag and this was immersed fo 24 h in five distilled water. The extract thus got was use for assessing its effects on plants.

Preparation of cow dung extract

Fresh cow dung was collected and shade dried. O kg of this was taken in a muslin cloth bag and immers for 24h in 10 l distilled water. The extract got was spray as such on plants.

Effect of organic sprays

Pot-culture experiments were conducted using Africa marigold (*Tagetes erecta* L.) as test crop. Each pot (25.5(cm dia x 18 cm height), was filled with four kg pottin mixture and planted with two seedlings of marigold. The experiment conducted had six treatments replicated four time in a completely randomized design.

T_1 - Vermiwash I
T_2 - Vermiwash II
T_3 - Cow dung extract
T_4 - Cow's urine
T_5 - Vermicast extract
T_6 - Control (water spray)

The characteristics of the extracts were presented in Table 1. All the extracts were sprayed as such without any dilution. To the spray fluid, one ml of teepol was added as a sticker. Spraying was done using a Ganesh sprayer and proper precautions were taken to prevent drift. Spraying was done at fortnightly intervals two weeks after planting. Observations were recorded at the time of planting, 30, 60 and 90 days after transplanting on plant height, number of

able 2. Effect of organic sprays on marigold plant characters*

reatments	Plant height (cm)				Number of laterals per plant			
	Days after transplanting				Days after transplanting			
	30	60	90	Mean	30	60	90	Mean
ermiwash I	34.65a	70.50b	102.50b	69.22b	7.50a	18.30a	28.70a	18.17a
ermiwash II	36.65a	78.30a	113.00a	75.98a	7.27a	17.60ab	26.80ab	17.22ab
ow dung	21.60b	64.20bc	94.50c	60.10c	6.33ab	15.30c	23.20c	14.94bcd
ow urine	23.50b	61.20c	88.70c	57.80cd	6.17ab	15.60bc	25.70b	15.82abc
ermicast extract	25.70b	60.30c	91.20c	59.07c	5.70ab	14.20cd	20.80d	13.57cd
ontrol (water spray)	19.90b	52.30d	90.50c	54.23d	4.80b	12.20d	19.70d	12.23d
lean	27.00	64.47	96.73	62.73	6.30	15.53	24.15	15.33

n a column, means followed by a common letter are not significantly different at the 5% level by DMRT P=0.05)

Mean of four replications

Table 3. Effect of organic sprays on marigold leaves*

Treatments	Number of leaves per plant				Leaf area (cm²)			
	Days after transplanting				Days after transplanting			
	30	60	90	Mean	30	60	90	Mean
Vermiwash I	44.20a	84.20a	148.20ab	92.20a	55.30a	105.30a	89.10b	83.23a
Vermiwash II	45.30a	86.30a	151.30a	94.30a	56.20a	106.80a	98.30a	87.10a
Cow dung	40.10ab	76.10b	143.10bc	86.43b	49.80a	99.80a	78.50c	76.03b
Cow urine	33.80bc	75.30b	140.60c	83.23bc	48.70a	89.70b	79.80c	72.73bc
Vermicast extract	39.80ab	65.80c	139.20c	81.60c	40.20b	88.70b	81.20bc	70.03c
Control	31.20c	60.30c	122.10d	71.20d	32.30b	76.50c	73.10c	60.63d
Mean	39.07	74.67	140.75	84.83	47.08	94.47	83.33	74.96

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT (P=0.05)

* Mean of four replications

Table 4. Effect of organic sprays on yield attributes of marigold*

Treatments	Days to flowering	Number of flowers per plant	Weight of flowers (g)
Vermiwash I	41.20a	28.30b	168.30c
Vermiwash II	40.20a	27.60b	158.90c
Cow dung	49.80b	25.20b	146.30b
Cow urine	47.50b	24.50b	144.20b
Vermicast extract	45.90ab	26.20b	138.30b
Control (water spray)	50.40b	20.10a	116.50a
Mean	45.83	25.32	145.42

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT (P=0.05)

* Mean of four replications

laterals and leaves produced. The leaf area was calculated using a leaf area meter and expressed in cm^2. Regarding yield parameters, the number of days taken from transplanting to first flowering, diameter of ten fully developed flowers, total number of flowers harvested from every plant and mean weight of all the flowers per plant were recorded. The data were subjected to Duncan's Multiple range test for compairing treatment means (Gomez and Gomez, 1984).

Results and Discussion

Growth parameters

Vermiwash II produced a mean plant heightof 75.98 cm and was significantly superior to all other treatments. The effect of vermiwash sprays (both I and II) were visible even 30 DAT (Table 2). Both the treatments recorded 34.65 and 36.65 cm plant height and were superior to other treatments. However, at 60 DAT and 90 DAT, the second type of vermiwash recorded 78.30 and 113.00 cm mean plant height and was significantly superior to the rest. With reference to the mean number of laterals produced per plant, the vermiwash extracts were superior to control even 30 DAT (Table 2). But the effects were more pronounced starting from 60 DAT to 90 DAT wherein vermiwash I was superior to the other treatments but statistically on par with vermiwash II. Vermiwash I and Vermiwash II produced 18.17 and 17.22 laterals respectively and were on par. The maximum mean number of leaves per plant were produced when foliar applications of vermiwash were given (94.30 and 92.20) (Table 3). This was evident as early as 60 DAT. At 90 DAT too, the same trend was noticed with both the types being on par statistically. There were significant differences between the treatments with reference to the leaf area (Table 3). The maximum leaf area was noticed with foliar application of vermiwash II (87.10 cm^2), which was statistically on par with vermiwash I (83.23 cm^2). However, the distinct differences between the two types of vermiwashes were visible only 90 DAT. Springett and Syers (1979) observed that the earthworms altered nutrient availability, altered the plant's ability to take up nutrients or affect the growth mechanisms of the plants. *L.rubell* casts probably contain an auxin-like substan or some substance that modified the effec of the plant auxins (Lee, 1985). Plant grow stimulation could be attributed to the presen of plant growth factors and group B vitamin produced by ceolamoebocytes of earthworm

Yield parameters

The foliar sprays also influenced the numb of days taken to flower. The mean numb of days taken to flower was distinctly lo in both the types of vermiwashes (41.20 a 40.20 days respectively). These treatments we however statistically on par with sprays vermicompost extract (45.90) (Table 4). Thou the mean number of flowers produced per pl was the greatest in those receiving Vermiw I spray, it was not distinct from the oth extracts. However, all the organic extracts prov to be significantly superior to water spray (Table 4 The maximum mean weight was recorded i vermiwash I treatment (168.30 g) which wa however on par with vermiwash II (158.90 g (Table 4). These two treatments were significantl superior to all the others. Gavrilov (1962) processe extracts of the tissues of *L.terrestris*, the soi from which they were collected, casts, mucu deposits in epidermal gland cells and coelomi fluid and showed that they contained plan growth factors and group B vitamins whic appeared to be produced by coelamoebocytes Nielson (1965) proposed the presence of plan growth promoting substances in *Aporrectode caliginosa, L. rubellus* and *E. fetida*. Atlavinyt and Daclulyte (1969) measured the vitamin B_{12} content of several soils planted with barle to which they added earthworms (*A.caliginosa A.rosea, L.rubellus* and *L.terrestris*) and foun that the amount of vitamin B12 began to increas from 4 to 12 months after introduction. Fro the results it could be seen that extract fro earthworms offer a valuable resource, whic could be effectively exploited for increasin the production of ornamentals like marigol

References

Ilavinyte, O. and Daclulyte, J. (1969). The effect of earthworms on the accumulation of vitamin B_{12} in soil. *Pedobiologia*, **9**: 165-170.

Javrilov, K. (1962). Role of earthworms in the enrichment of soil by biologically active substances. *Voprosy Ekologi Vysshaya Shkola Moscow* **7**: 34.

Gomez, K.A. and Gomez, A.A. (1984). Statistical procedures for agricultural research. New York: John Wiley and Sons, 680 pp.

Ismail, S.A. (1997). Vermicology : The biology of earthworms. Chennai : Orient Longman Ltd. 90 pp.

Lale, K.E. (1998). Earthworm: Cinderella of Organic farming, Bangalore: Prism books Pvt. ltd. 88 pp.

Lee, K.E. (1985). Earthworms; their ecology and relationships with land use. Sydney: Academic Press, 411 pp.

Nielson, R.L. (1965). Presence of plant growth substances in earthworms demonstrated by paper chromatography and the went pea test. *Nature*, **208**: 1113-1114.

Springett, J.A. and Syers, J.K. (1979). The effect of earthworm casts on rye grass seedlings. In proc.2nd Australian Conf. Grassl. Invert. Ecol. (Crosby, T.K. and Pottinger, R.P. eds.). Wellington: Government Printer, 44-47.

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