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Estimation of soil meso arthropods population in different manures

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Abstract
A lab investigation was undertaken during *Kharif*-2013 to estimate the population of soil micro arthropods in different manures like FYM, Enriched compost, Vermicompost, Urban compost, Goat manure, Poultry manure and Soil (as check). Different manurial samples were collected from June to December, 2013 among these manure samples extracted through berleese funnel and the population of micro arthropods. Total micro arthropods population more in poultry manure (88.37/100 g of sample) goat manure (79.87/100 g of sample)urbancompost(74.75/100g of sample) FYM (70.37/100 g of sample) vermicompost (76.64/100g of sample) enriched compost (70.70/100 g of sample) than compatred to all other manures.

Keywords: Soil micro arthropods, poultry manure, goat manure, vermicompost

Introduction
Soil is the most valuable resource, since this is essential to the entire plant life on which animal and human life depends. Soil contains wide assortment of organic, inorganic substances, water and gases thus provide a unique medium for growth and development of micro-organisms and soil invertebrates. In general, soil invertebrates are classified according to their size into three classes *viz.*, micro fauna, meso fauna and macro fauna. Soil ecosystem services are reliant upon soil fauna which provide benefit to human population. They support most production systems through soil formation, nutrient cycling and primary production and also participate in provision of regulation services like climate regulation and detoxification. Without soil organisms, the soil would be a sterile medium that could not sustain crop production. Soil biota provides essential benefits for the functioning of agro ecosystems which are important for the long term sustainability of agriculture. They support essential soil processes and play a key role in maintaining the soil quality that is necessary for crop productivity. Soil organisms help to create and maintain beneficial soil structure and decomposing crop residues so that valuable nutrients are released for plant growth and contribute to soil carbon storage by mixing organic materials with mineral soil. Long-term and large number of soil inorganic fertilizer applications can affect negatively on soil fertility, soil biodiversity and crop products quality (Gruzdeva *et al*., 2007) [5]. By, considering the increasing importance of organic agriculture, soil organic manure applications are desirable and recommended. The effect deriving from organic manure applications includes numerous benefits resulting in an improvement of physical, biological and chemical soil properties, *i.e.* porosity, aggregates stability, water exchange and fertility (Tester, 1990) [9]. Heavy agricultural reliance on synthetic-chemical fertilizers and pesticides is having deletorius impacts on soil arthropods and the environment. With this background studies on soil arthropods in different farming systems were taken up.

Material and methods
To know the meso arthropods population in different manures the experiment was conducted in the Department of Entomology during 2013, Agriculture College Dharwad. The samples were collected from different manures which are mentioned below. Manure samples were collected from these pots in three replications with an interval of three weeks and soil samples extracted through berleese funnel

Results and discussion
Among the different manures significantly higher population of meso arthropods recorded in poultry manure (88.37/100 g of sample) followed by goat manure (79.87/100 g of sample), vermicompost (76.04/100 g of sample), urban compost (74.75 /100 g of sample), and less population recorded in enriched compost (70.70) and FYM (70.37/100 g of sample) which

were on par with each other. Poultry manure recorded significantly more population of other mites (130.33/100 g of sample), collembolans (122.66/100 g of sample), cryptostigmatids (121.00/100 g of sample), pseudo scorpions (90.66/100 g of sample), beetles (80.33/100 g of sample), diplurans (70.66/100 g of sample), woodlouse (50.67/100 g of sample) and ants (40.66/100 g of sample) compared to all other manures (Table 1).

Sl.No.	Manures	Collected from
1	FYM	MARS, Dharwad
2	Enriched compost	MARS, Dharwad
3	Vermicompost	MARS, Dharwad
4	Poultry manure	Poultry unit, UAS, Dhrwad
5	Urban compost	Hubli –Dharwad municipal corporation
6	Goat manure	Dairy unit
7	Soil (as check)	MARS, Dharwad

Table 13: Population of meso arthropods in different manures during 2013 (per 100 g of soil)

Manures(A) / Soil arthropods(B)	Poultry manure (100 g of sample)	Goat manure (100 g of sample)	Urban compost (100 g of sample)	FYM (100 g of sample)	Vermi compost (100 g of sample)	Enriched compost (100 g of sample)	Mean	Soil (100 g of sample)
Collembola	122.66 (11.10)	115.33 (10.76)	119.33 (10.95)	114.00 (10.70)	118.66 (10.92)	115.44 (10.77)	117.57a	9.00 (3.08)
Cryptostigmatids	121.00 (11.02)	119.33 (10.95)	115.33 (10.76)	115.67 (10.78)	116.66 (10.82)	115.56 (10.77)	117.26a	9.66 (3.19)
Other mites	130.33 (11.44)	120.66 (11.01)	116.00 (10.79)	111.66 (10.59)	115.33 (10.76)	112.67 (10.64)	117.78a	15.33 (3.98)
Pseudo scorpion	90.66 (9.55)	70.33 (8.42)	50.33 (7.13)	70.00 (8.40)	80.33 (8.99)	40.33 (6.39)	67.00b	6.33 (2.61)
Woodlouse	50.67 (7.15)	40.33 (6.39)	41.33 (6.47)	40.33 (6.39)	40.66 (6.42)	30.33 (5.55)	40.60e	4.00 (2.12)
Ants	40.66 (6.42)	36.66 (6.10)	30.66 (5.58)	30.33 (5.55)	25.66 (5.11)	30.11 (5.53)	32.35f	4.33 (2.20)
Dipluran	70.66 (8.44)	65.67 (8.13)	60.00 (7.78)	50.33 (7.13)	50.89 (7.17)	40.45 (6.40)	56.33d	5.00 (2.35)
Beetles	80.33 (8.99)	70.67 (8.44)	65.00 (8.09)	30.66 (5.58)	60.11 (7.79)	80.6(9.01)	64.57c	3.66 (2.04)
Mean	88.37a	79.87b	74.75d	70.37e	76.64c	70.70e	76.68	7.16
	S.Em.±(A)	CD(A)(P=0.01)	S.Em.±(B)	CD (B)(P=0.01)	AXB			
	0.43	1.17	0.40	1.09	2.90			

Interaction effect was found significant between different manures and meso arthropods population. Significantly highest population was recorded in Poultry manure with other mites (130.33/100 g of sample) whereas significantly least population was recorded in enriched compost with respect to ants population (30.11/100 g sample) (Table 1). Poultry manure and goat manure recorded more population of soil micro arthropods compared to other manures it may be due to higher amount of Nitrogen (N) (3.03 per cent) and Phosphorous (P) (2.63 per cent) in poultry manure, 3.00 per cent of N and 1.00 per cent P in goat manure. Whereas in FYM 0.5 per cent of N and 0.50 per cent of phosphorous (P). Availability of nitrogen and phosphorous might have helpd to increase the meso arthropods population in poultry manure and goat manures compared to other manures. In poultry manure amount of N and P which are 6.0 and 8.76 times higher as compared to enriched compost. Whereas, in goat manure amount of N and P which is 6.0 and 3.33 times higher as compared to enriched compost manure which contains N and P at 0.50and 0.30 per cent respectively. The present findings are also in line with Carey *et al*. (1971) [2], Potter *et al*. (1985) [8] who reported that nitrogen and phosphorous helpful in increasing the meso arthropods population.

Irrespective of different manures more population of other mites (117.78/100 g of sample), cryptostigmatids (117.26/100 g of sample) and collembolans (117.57/100 g of sample) were recorded as compared to other meso arthropods. It may be due to collembolans and mites enhance microbial activity, which accelerate decomposition of organic matter and mediate transport processes in the soil. Even when they do not transform ingested material significantly, they breakdown, moisten it and make it available for microorganisms (Berg and Pawluk, 1984) [1]. Collembolans enhance the microbial activity in the soil and cryptostigmatids are primary decomposers they decompose the organic matter. Both these are helpful in decomposition process. They also helpful in increasing other predatory arthropods like psedoscorpions, other mites (Prostigmata and Mesostigmata) which are density dependent and interrelated with collembolan and mites' population. The present findings are in corroborating with observations of Marshall (1977) [6] who reported that the oribatids tend to respond less rapidly than the other Acari orders. This is probably because of their long life cycle and saprophagous feeding habits, whereas the Mesostigmata and Prostigmata are primarily predators with relatively short periods between generations. The Astigmata are mainly saprophagous with short life cycles and like the Mesostigmata and Prostigmata, could quickly take advantage of favourable conditions induced by fertilization. The present findings are in line with the findings of Mrohs (1961) [7], Gisin (1955) [4] and Christiansen (1964) [3] who concluded that, manures are generally effective in increasing soil collembolans and mites population.

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