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Research Article

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Study the Effect of Nanobiomic Manure on Agronomic and Biochemical Characteristics in intercropping of Roselle (*Hibiscus sabdariffa*) with Cowpea (*Vigna unguiculata*)

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Abstract In order to study the effect of nanobiomic manure on agronomic and biochemical characteristics in intercropping of sour tea with cowpea, an experiment has been conducted as split plot in a randomized complete block design with three replications at the Research Farm of Agriculture Center of Zabol University in Zahak during the growing season of 2015-2016. The factors studied in this study include bio-fertilization of nanobiomic as the main plot in two levels of use and non-use of bio fertilizer and different levels of intercropping in five levels: sole sour tea, sole cowpea, 50% sour tea + 50% cowpea, 75% sour tea + 25% cowpea and 25% sour tea + 75% cowpea were as sub plot. Analysis of variance showed that the effect of nanobiomic and intercropping on all characteristics was significant.

Keywords Carbohydrate, Potassium, phosphor

Introduction

Farmers were happy of getting increased yield in agronomy in the beginning. Biofertilizers is a large population of a specific or a group of beneficial microorganisms for enhancing the productivity of soil. Organic fertilizer are natural products used by farmers to provide food (plant nutrients) for the crop plants such as farmyard manure, green manures, compost prepared from crop residues and other farm wastes, animal bones, slaughter house refuse etc. The organic fertilizers play an main role in increasing growth, yield and yield components of many crop plants. Ryan *et al.* [1] worked on organic fertilizers in crops and reported that organic manures significantly affected plant height, leaf area and fruit number plant. Abd El-Rahman and Hosny [2] stated that using organic manure improved the yield and yield components of egg-plant fruits. Organic manures increase the organic matter in the soil. Organic matter in turn releases the plant food in available form for the use of crops. However, organic manures should not be seen only as carriers of plant food. These manures also enable a soil to hold more water and also help to improve the drainage in clay soils. They provide organic acids that help to dissolve soil nutrients and make them available for the plants. Plant nutrient uptake can be improved by intercropping [3-4]. Nitrogen (N) transfer from the N-fixing legume to the maize and other species has also been reported [5-6], reducing the need for N fertilizer. Growing plant species with differing root architecture in the same field also can increase nutrient use efficiency. For example, the residual nitrate concentration is reported to be reduced after harvest of maize intercropped with water convolvulus compared with the crops in monoculture [7]. Thus, intercropping may be an important strategy to use N efficiently and to reduce the risks of N leaching. Roselle (*Hibiscus sabdariffa*) belongs to the family Malvaceae. It is an erect, mostly branched, annual, herbaceous sub shrub that grows mainly in warm humid tropical and subtropical climates. Vernacular names in English speaking regions are rozelle, sorrel, and red sorrel while in Arabic it is known as karkade; in French, osielle rouge or oseille de Guinée. In Senegal Bisap is commonly used [8]. Cowpea (*Vigna unguiculata* L.

Walp.) is one of the important grain legumes in the world and is playing an important role in the livelihood of millions of people in developing countries [9].

Material and Methods

Location of Experiment

The experiment was conducted at the Research Farm of Agriculture Center of Zabol University in Zahak during the growing season of 2015-2016.

Composite Soil Sampling

Composite soil sampling was made in the experimental area before the imposition of treatments and was analyzed for physical and chemical characteristics.

Field Experiment

The field experiment has been conducted as split plot in a randomized complete block design with three replications

Treatments

The factors studied in this study include bio-fertilization of nanobiomic as the main plot in two levels of use and non-use of bio fertilizer and different levels of intercropping in five levels: sole sour tea, sole cowpea, 50% sour tea + 50% cowpea, 75% sour tea + 25% cowpea and 25% sour tea + 75% cowpea were as sub plot.

Data Collection

Tables and charts are done using Word and Excel. Comparison of mean treatments using Duncan's multiple range test was investigated at 5% level.

Results and Discussion

Carbohydrate

Analysis of variance showed that the effect of nanobiomic and intercropping on carbohydrate was significant (Table 1). The maximum of carbohydrate of treatments No nanobiomic + 50% sour tea + 50% cowpea (192.33µg glucose. wet weight) was obtained (Table 2). The minimum of carbohydrate of treatments nanobiomic application + 75% sour tea + 25% cowpea (128µg glucose. wet weight) was obtained (Table 2). According to the results, it can be stated that with increasing age of the plant, the need for strengthening and retaining tissues also increases and most of these tissues consist of building carbohydrates. Therefore, as the plant growth period becomes more complete, the amount of these carbohydrates is increased. On the other hand, the leaves of the plant, as the main source of photosynthesis, have more enzymatic activity and more non-structural carbohydrates than the stems [10].

Table 1: ANOVA analysis of the cowpea affected by nanobiomic manure and intercropping

		MS		
Sov		**Carbohydrate**	**Potassium**	**phosphor**
R	2	280.4ns	0.10ns	0.0014ns
Nanobiomic	1	1401.9*	706.86**	0.0783**
Error a	2	243.1	2.009	0.0091
Intercropping	3	843.4*	89.50**	0.4053**
Nanobiomic*Intercropping	3	1525.2**	753.9**	1.9872**
Error b	12	212.46	6.770	0.0071
CV	-	9.44	2.95	3.75

*, **, ns: significant at $p<0.05$ and $p<0.01$ and non-significant, respectively.

Potassium

Analysis of variance showed that the effect of nanobiomic and intercropping on potassium was significant (Table 1). The maximum of potassium of treatments Nanobiomic application + Pure phosphor (111.52 ppm) was obtained (Table 2). The minimum of potassium of treatments No nanobiomic + Pure phosphor (75.15 ppm) was obtained (Table 2). Lack of essential nutrients can cause nutrient imbalances in the plant and reduce water use efficiency and ultimately decrease the quality and quantity of the product. The essential elements play a role

in regulating the opening and closure of the apertures, which performs this by storing the potassium element in the protective ophthalmic cells [11].

Phosphor

Analysis of variance showed that the effect of nanobiomic and intercropping on phosphorwas significant (Table 1). The maximum of phosphor of treatments nanobiomic application + 75% sour tea + 25% cowpea (3.0240 ppm) was obtained (Table 2). The minimum of phosphor of treatments nanobiomic application + pure phosphor (1.3402 ppm) was obtained (Table 2). One of the factors affecting nutrient deficiency is the high level of phosphorus available in the soil, and this deficiency is due to their interaction within the plant system, which is reduced by increasing the amount of one in the plant organs [12].

Table 2: Comparison of different traits affected by affected by nanobiomic manure and intercropping

Treatment	Carbohydrate (µg glucose. wet weight)	Potassium (ppm)	Phosphor (ppm)
No nanobiomic + Pure phosphor	160.48bc	75.15e	2.9896a
No nanobiomic + 50% sour tea + 50% cowpea	192.33a	76.46e	1.6838e
No nanobiomic + 75% sour tea + 25% cowpea	145.95bcd	92.62c	2.0274d
No nanobiomic + 25% sour tea + 75% cowpea	149bcd	84.13d	2.5085b
Nanobiomic application + Pure phosphor	160.86bc	111.52a	1.3402f
Nanobiomic application + 50% sour tea + 50% cowpea	133.71cd	96.63b	2.1649cd
Nanobiomic application + 75% sour tea + 25% cowpea	128d	75.56e	3.0240a
Nanobiomic application + 25% sour tea + 75% cowpea	164.05b	90.06c	2.2233c

Any two means not sharing a common letter differ significantly from each other at 5% probability

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