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Effect of Organic Fertilizers and Soil Conditioners on the Quality of Apple Maiden Trees

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- The quality of maiden trees has a decisive effect on the tree growth and yield during the first years in a newly-established orchard

- Each millimetre of increase in the trunk diameter of a maiden tree in the nursery results in a specific increase in the yield of the young tree in the orchard

- Maiden trees that are not correctly fertilized in the nursery do not form lateral branches, or those formed are generally very short

- The availability of organic nitrogen fertilizers for organic farming is normally limited.
- Frequently maiden trees for organic production are produced in derogation to the EU rules

- There is a need to define strategies to nutrient management according to organic farming standards. Such need is being addressed in the framework of the project ‘Development of innovative products and technologies for organic fruit production’

MATERIALS AND METHODS

- The trial was conducted in 2010-2011 in an experimental nursery located near Skierniewice (Poland), on a podzolic soil.

- The treatments were applied in the first year (2010) of running the nursery, on M 26 apple rootstocks, and in the second year, after grafting, on maiden trees of two apple cultivars (‘Topaz’ and ‘Ariwa’).

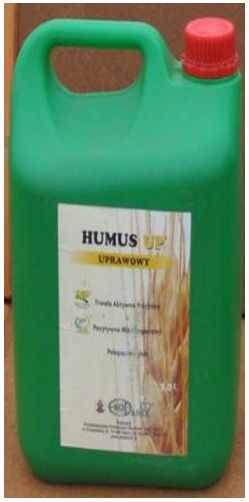
PRODUCTS APPLIED

Dry manure

Seaweed extract

Or

Plant extract reinforced with amino acids

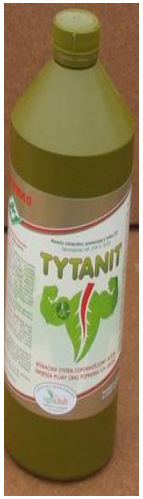


Vermicompost extract

Or

Vermicompost extract with the addition of a product derived from molasses

Exhausted yeast production culture broth



Tytanit

Microbial inoculum

containing mycorrhizal fungi (*G. mosseae* and *G. intraradices*) and PGPR (*P. fluorescence* and *B. subtilis*)

Mineral elements content of the applied products

PRODUCT	pH	C	N	P	K	Mg	Ca	S	Na
		%		mg/kg					
MICOSAT	5.88	40.6	0.15	431	9558	1647	5871	*	906
HUMUS UP	13.0	0.65	0.03	30.8	4535	26.6	123	66.1	32.03
HUMUS ACTIVE	8.30	0.78	0.03	1050	4119	111	394	165	30.9
AKTYWIT PM	12.8	20.5	0.92	81.2	42990	50.2	778	2255	2709
BIO FEED QUALITY	4.01	0.57	0.07	32.6	*	*	*	*	702
BIO FEED AMIN	3.92	1.12	0.14	347	*	*	*	*	1278
TYTANIT	3.40	*	*	*	*	*	*	*	*
VINASSA	5.19	12.0	1.86	949	17615	419	5822	5819	6148

Mineral elements content of the applied products

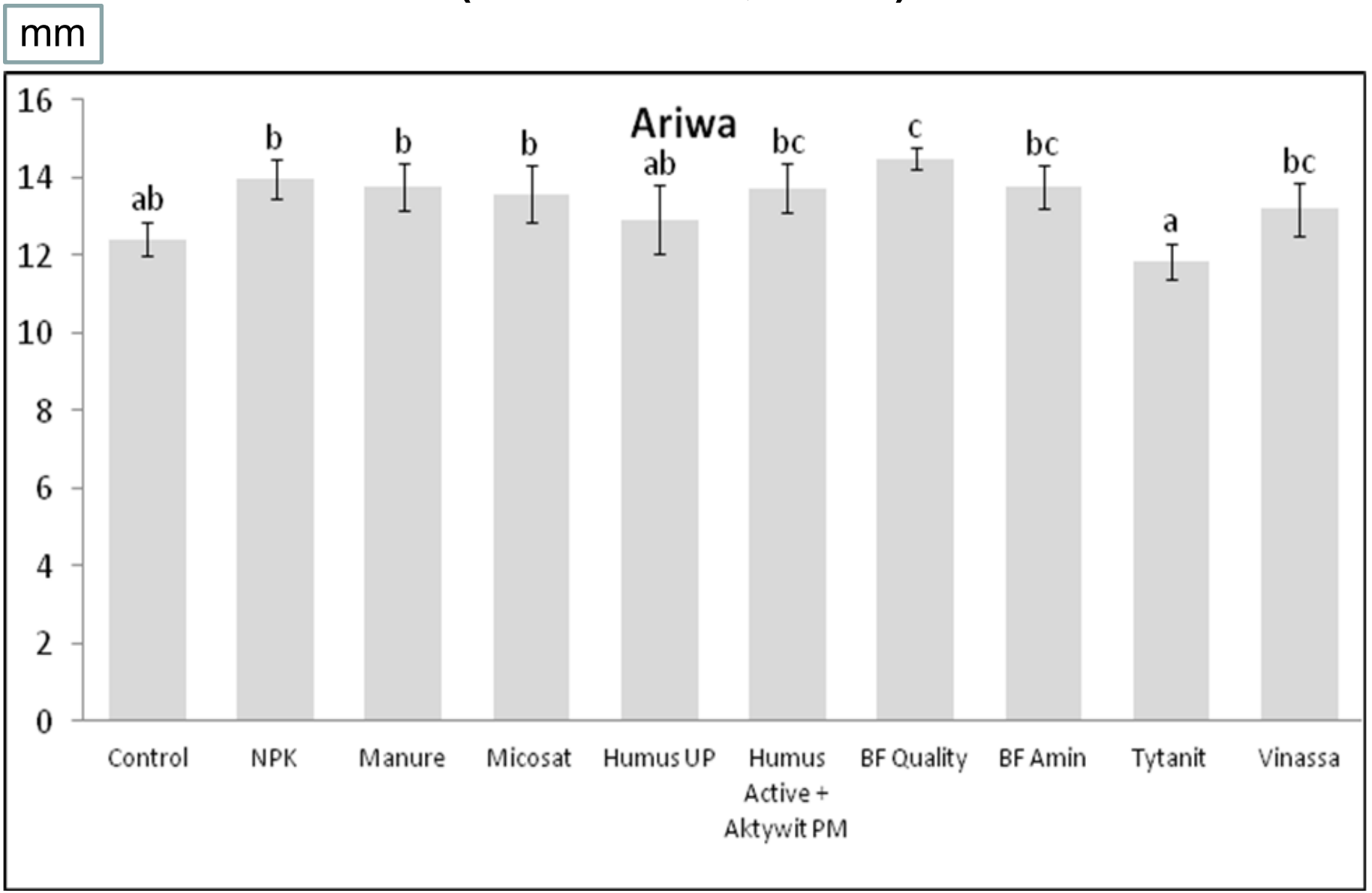
PRODUCT	B	Mo	Mn	Zn	Cu	Fe	Ti	As	Cd	Hg	Pb
	mg/kg										
MICOSAT	*	*	*	*	*	*	*	2.87	0.06	<0.01	0.21
HUMUS UP	0.31	0.13	2.16	13.2	0.70	38.6	*	0.02	0.01	<0.01	0.32
HUMUS ACTIVE	1.51	0.12	5.92	7.27	0.40	74.7	*	0.15	0.01	<0.01	0.28
AKTYWIT PM	1.41	0.68	21.5	23.2	0.65	46.6	*	0.01	0.01	<0.01	0.21
BIO FEED QUALITY	1.57	0.02	1.21	1.10	0.16	5.20	*	0.35	0.01	<0.01	0.36
BIO FEED AMIN	0.78	0.08	3.18	8.30	0.49	35.7	*	0.03	0.01	<0.01	0.37
TYTANIT	*	*	*	*	*	*	3163	0.01	0.01	<0.01	0.99
VINASSA	7.67	0.22	12.6	2.14	0.39	50.9	*	0.03	0.01	<0.01	0.88

Amount of NPK applied with the different products (kg/ha)

Treatment	N	P	K
0. CONTROL	0	0	0
1. NPK	70	26	100
2. MANURE	45	13	17
3. MICOSAT	23	6.5	12
4. HUMUS UP/ 5. HUMUS ACTIVE+ ACTYVIT	1	0.1	0.2
6. BFQUALITY 7. BFAMIN	23	6.5	8.5
8. TYTANIT	23	6.5	8.5
9. VINASSE	23	6.5	8.8


1
3
6

Effect of various fertilization treatments on trunk diameter (means ± SD, n= 40)



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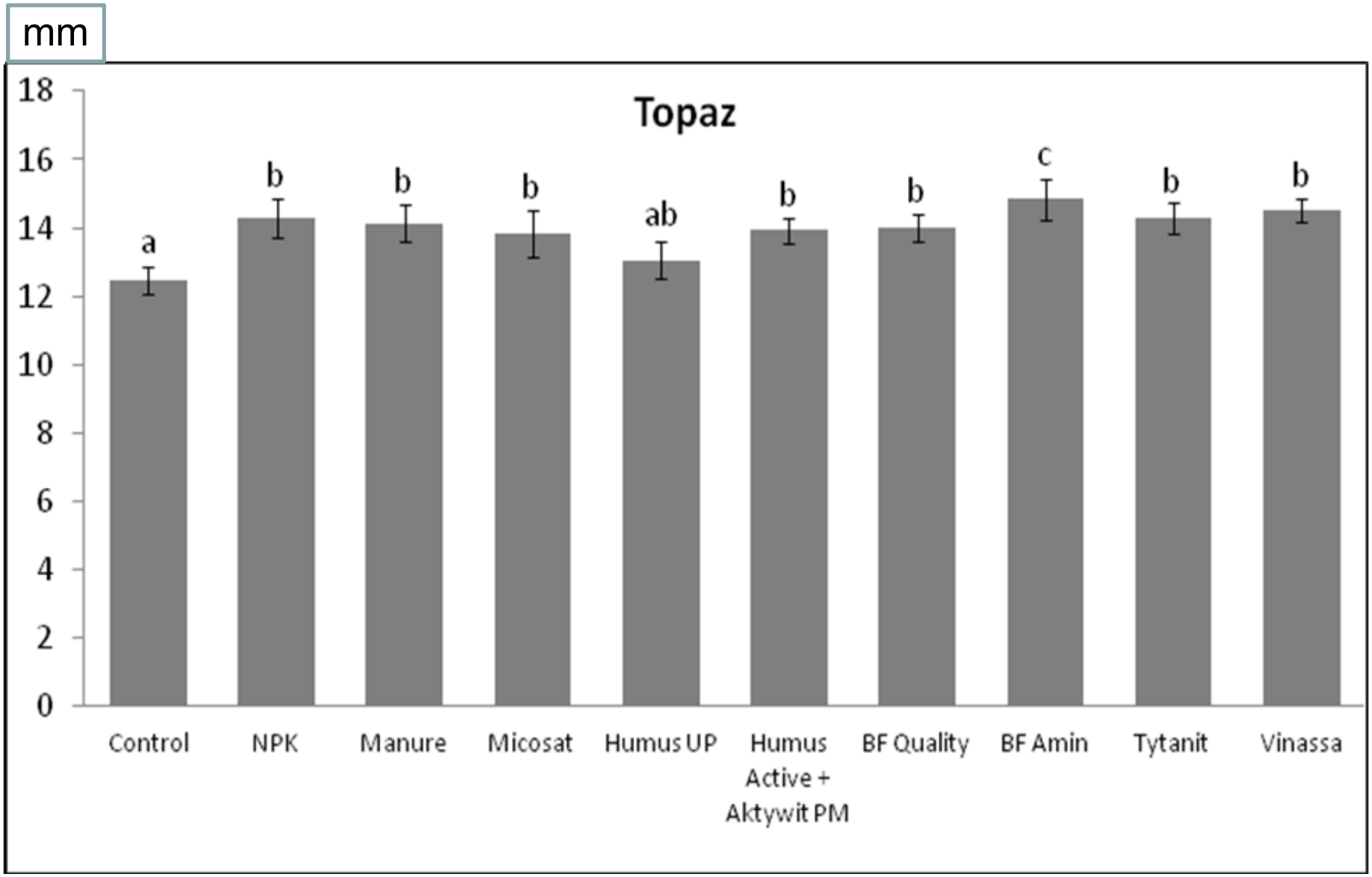
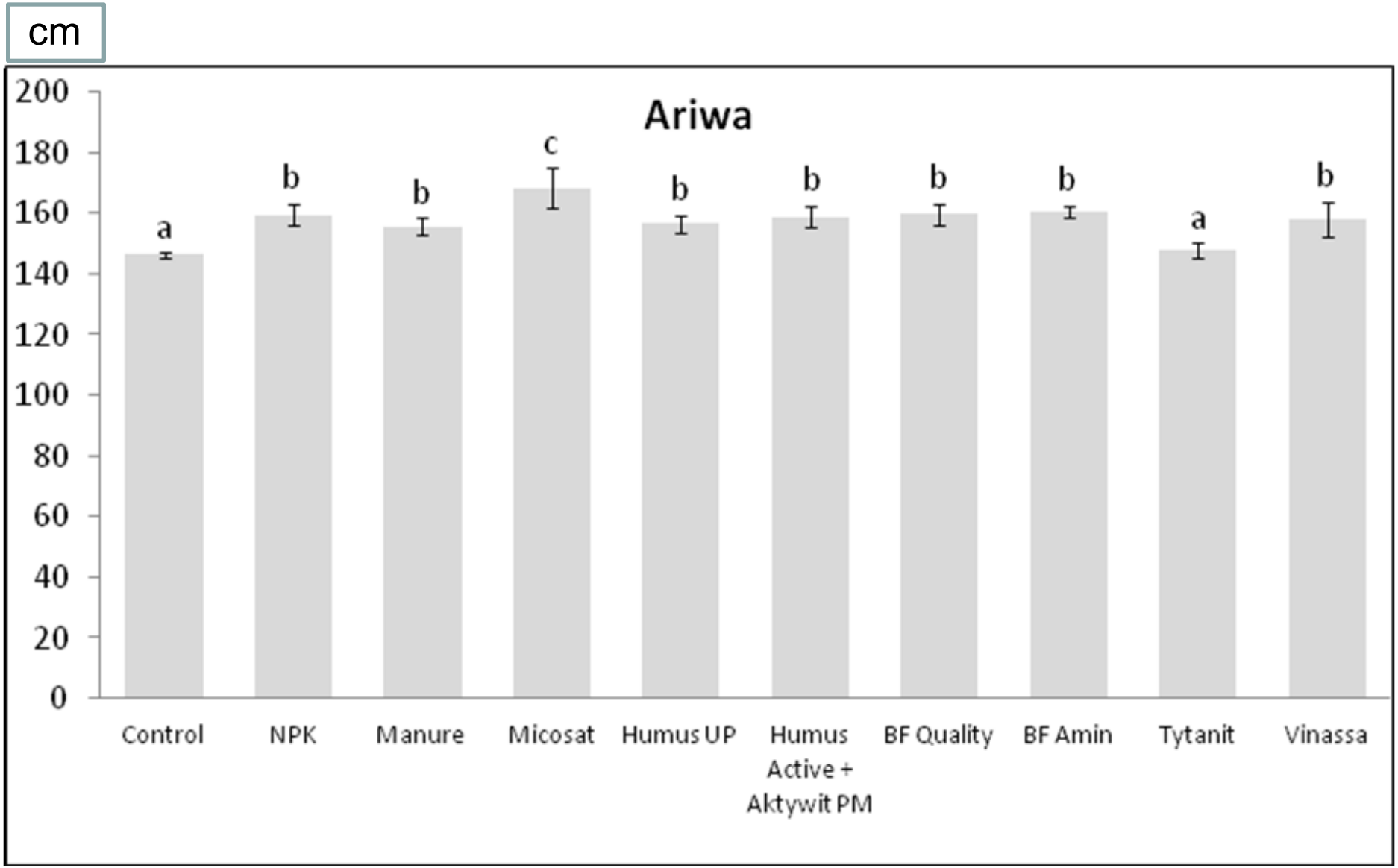


Effect of various fertilization treatments on tree height (means ± SD, n= 40)



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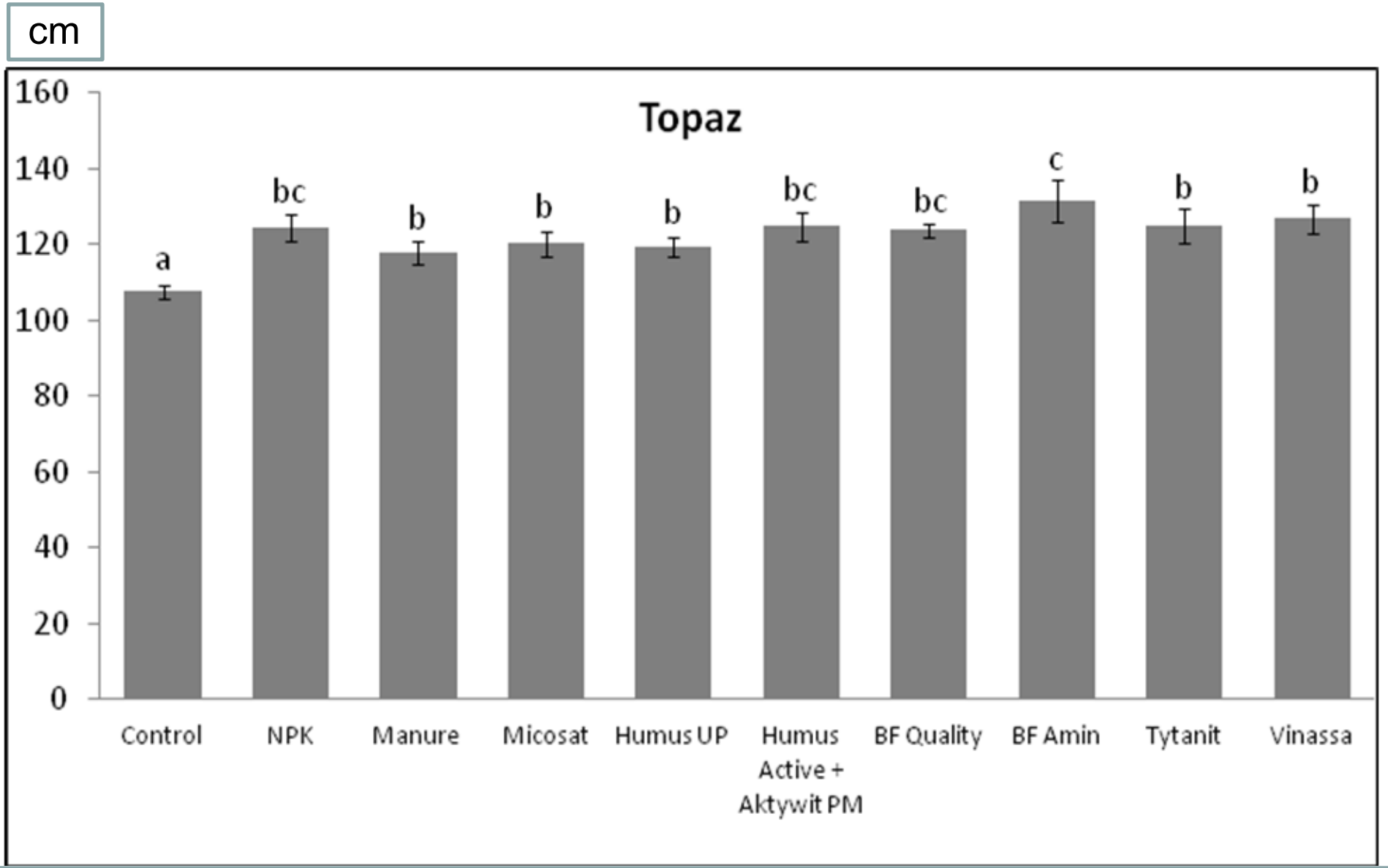
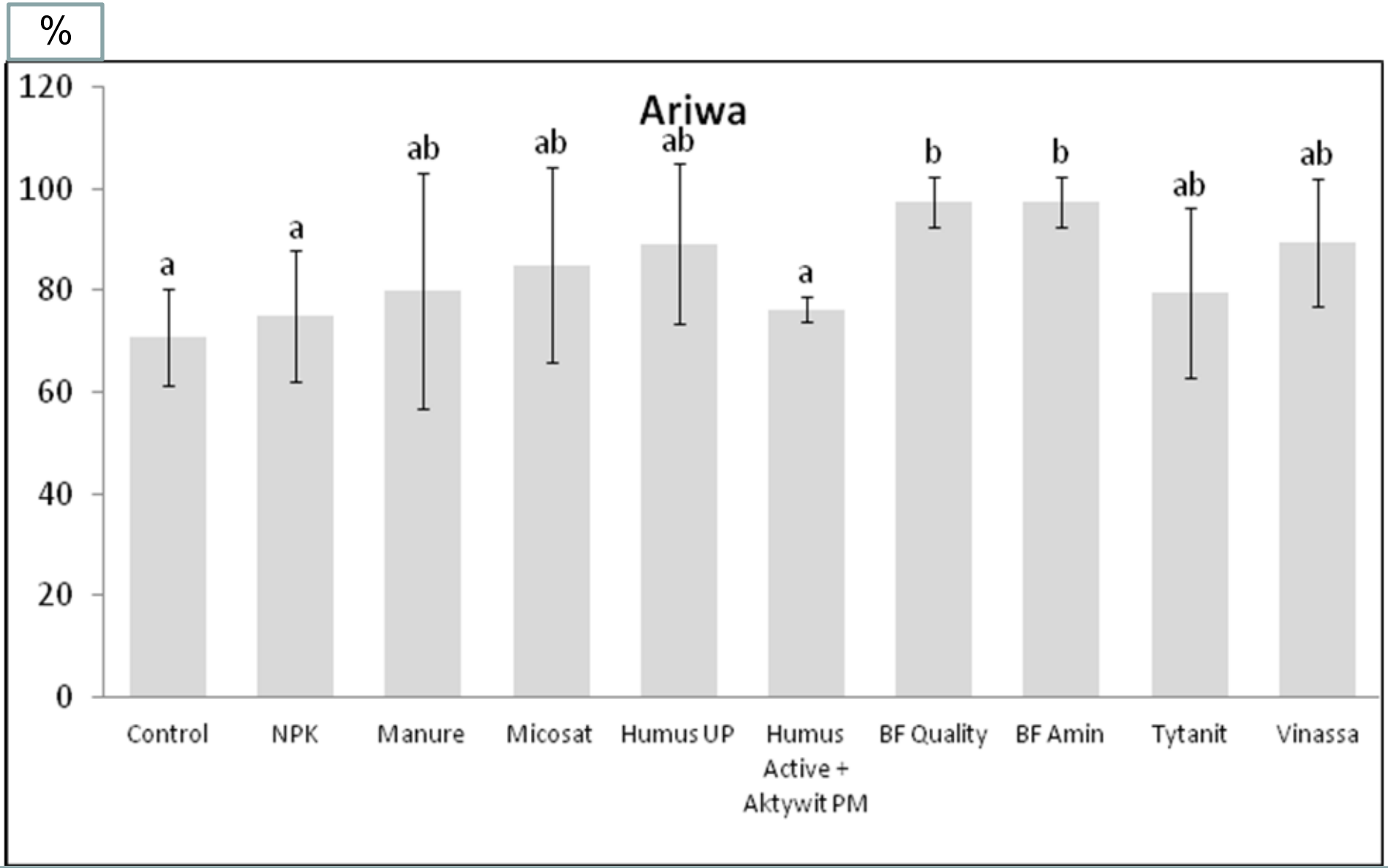


Effect of various fertilization treatments on the frequency of branched trees (means ± SD, n= 40)



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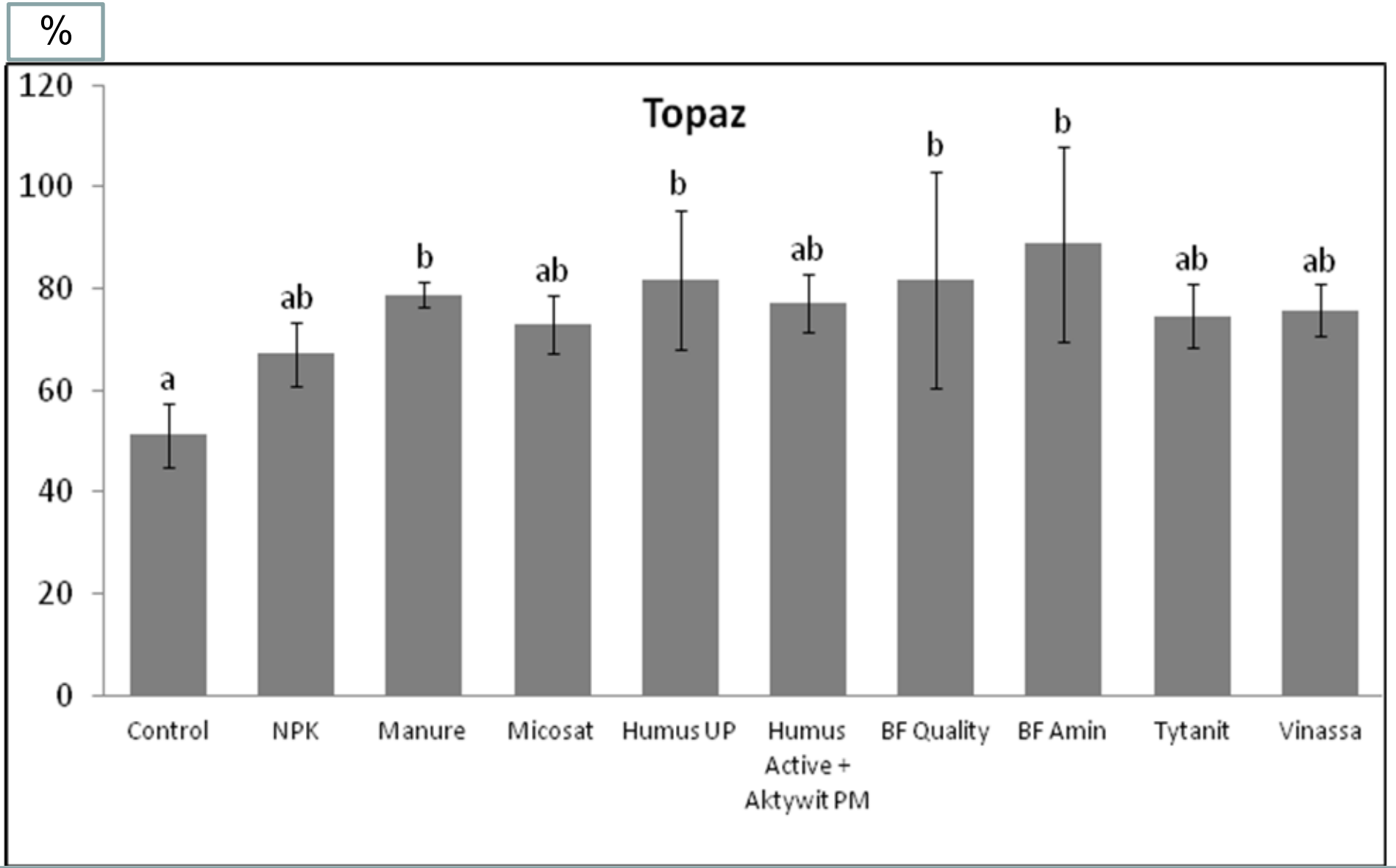
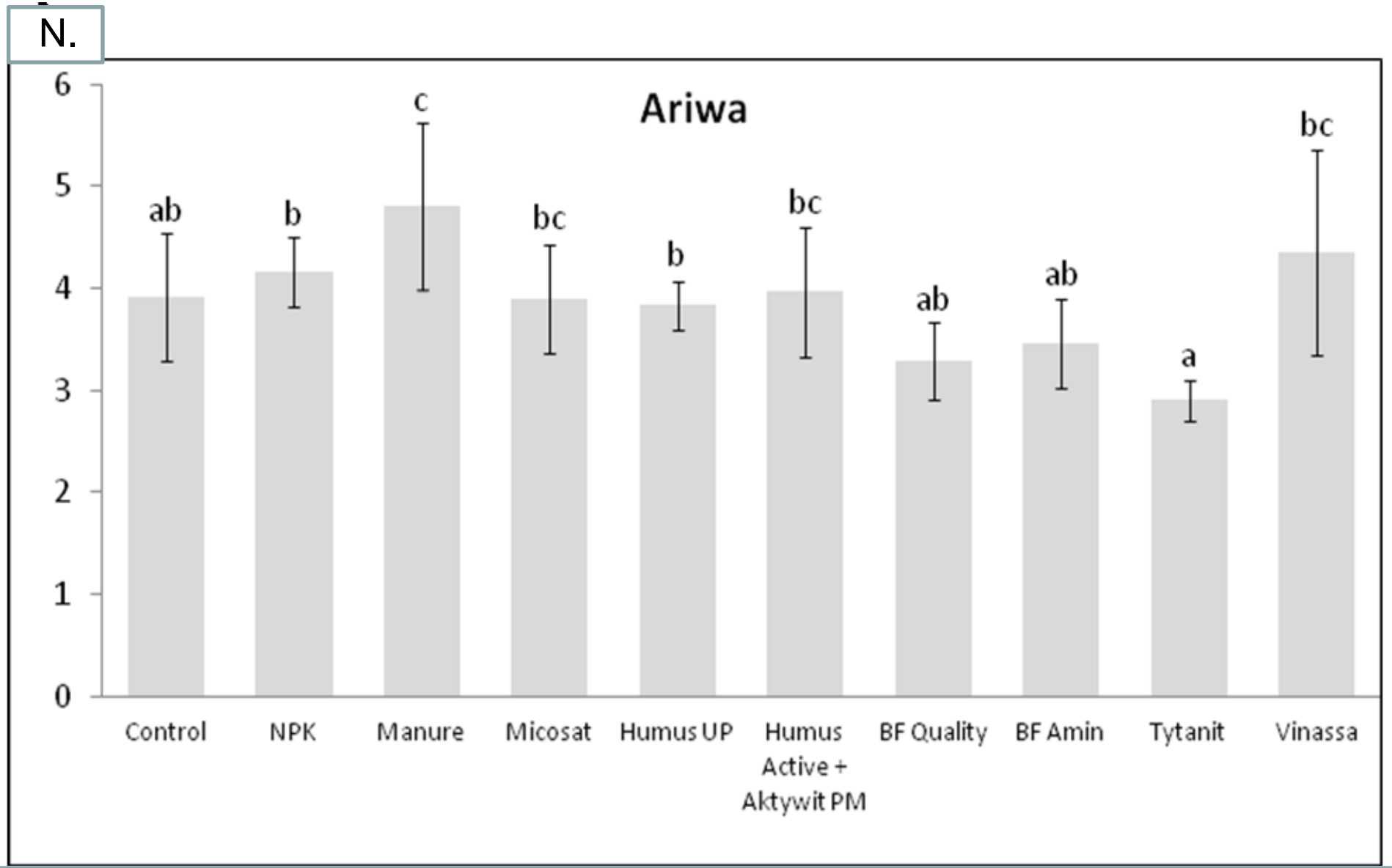


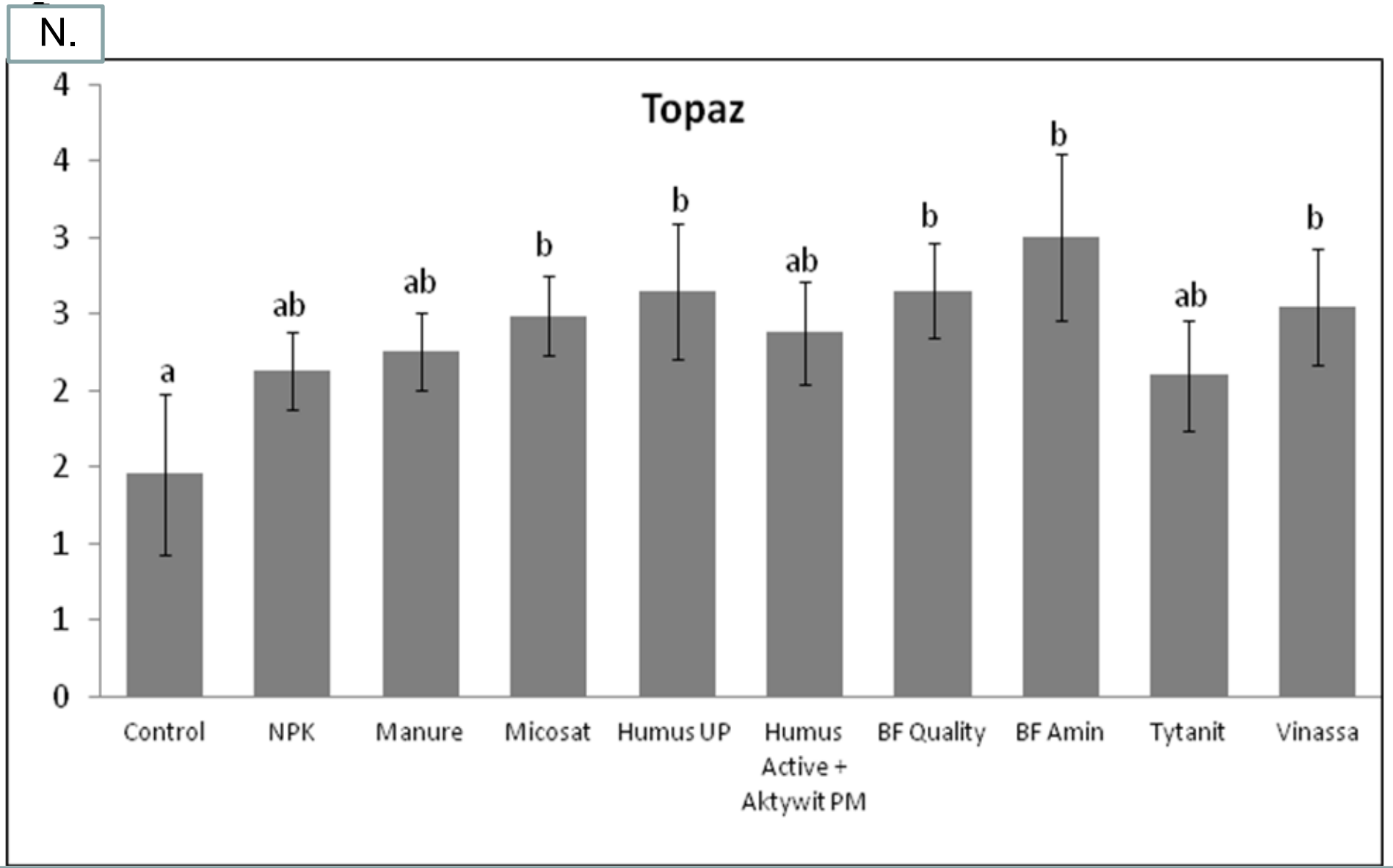

Control


BF Amin

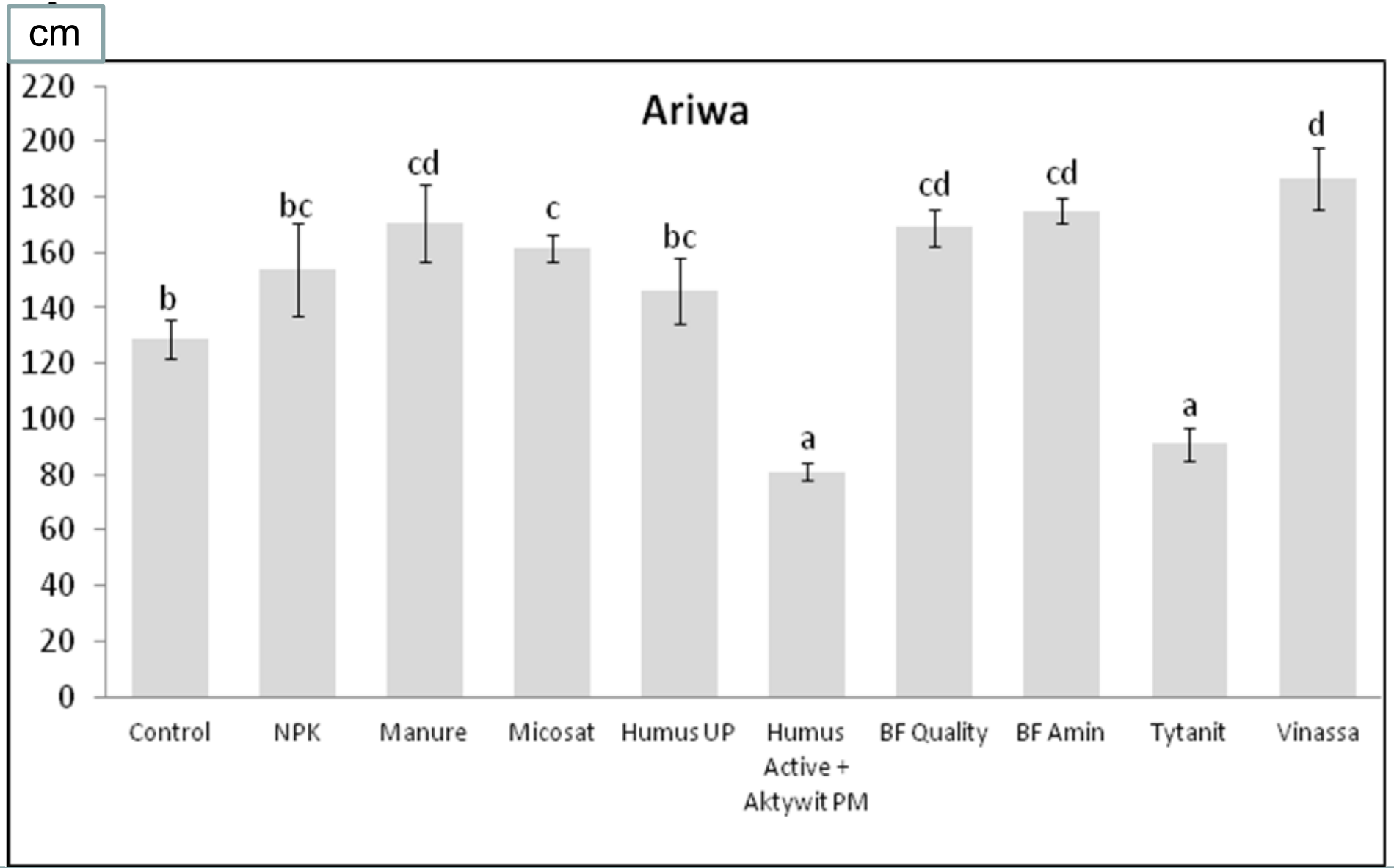
Effect of various fertilization treatments on the number of lateral shoots (means ± SD, n= 40)



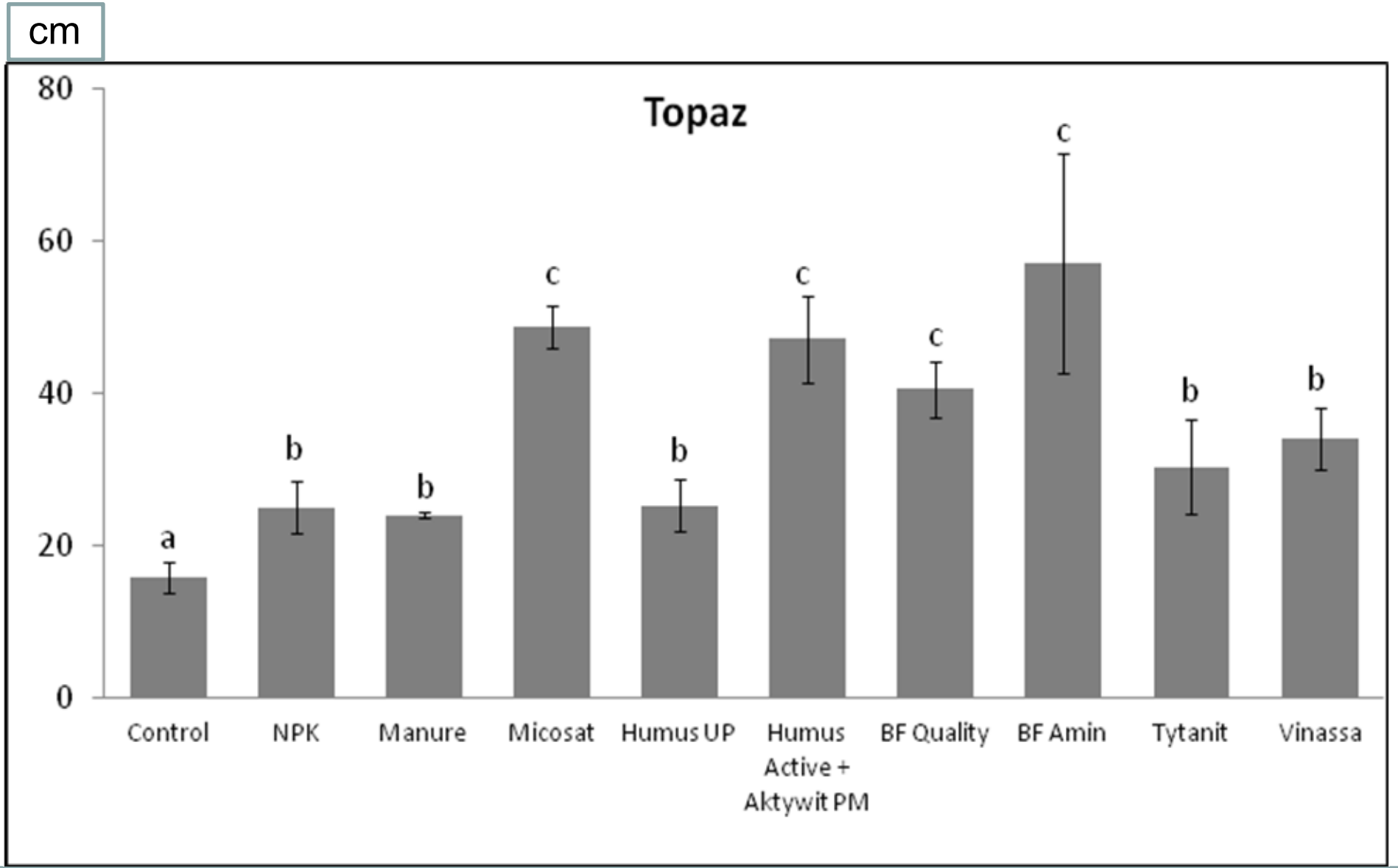
Effect of various fertilization treatments on the number of lateral shoots (means ± SD, n= 40)



Effect of various fertilization treatments on the total length of the lateral shoots (means ± SD, n= 40)



Effect of various fertilization treatments on the total length of the lateral shoots (means ± SD, n= 40)



Side effect of organic fertilization treatments

NPK

BF Quality

CONCLUSIONS

- Different organic fertilizers and soil amendments can effectively be applied to manage the nutrition of apple maiden trees in organic nurseries, producing trees of a quality equivalent or superior to that of chemically fertilized nurseries.
- Maiden apple trees fertilized with granulated manure grew and branched out similarly to those fertilized with NPK. Manure, however, enhanced the growth in length of lateral shoots to a greater extent than NPK.
- Mycorrhizal fungi and plant growth promoting bacteria, used in the form of the preparation Micosat, improved the growth of apple maiden trees and enhanced their branching.

CONCLUSIONS

- Vermicompost extracts (Humus UP and Humus Active) had a positive effect on the growth of the apple maiden trees, but less pronounced then other products and generally more prone to differences due to cultivar specific factors.

- The use of seaweed extracts (BF Quality) and of vegetal extracts rich in aminoacids (BF Amin) as foliar treatments enhanced tree growth both in terms of thickness and height, and in the length of lateral shoots.

- These products increased the number of branched maidens, especially of the cultivar ‘Topaz’.

CONCLUSIONS

- Vinassa foliar applications markedly improved the growth and quality of maiden apple trees produced under organic conditions.
- The effect of this product is conducive to branching out of the trees and strongly affected the growth of lateral shoots.
- Tytanit showed little effect on the growth intensity of maiden apple trees.

CONCLUSIONS

- In conclusion, the products BF Amin, BF Quality, Vinassa, Micosat, and Humus UP, were showing to improve the biological potential of the plants, increasing the biomass synthesis, which affects positively the quality of the propagating material.


Thank you for attention