

Effects of organic amendment on quinoa productivity in Rehamna region

Amira Fetouab¹, Redouane Choukr-Allah², Mohammed El Gharous¹, Manal Mhada¹, Abdelaziz Hirich³

¹ Mohamed VI Polytechnic University, BenGuerir, Morocco
² Agronomic and Veterinary Institute Hassan II, Agadir, Morocco
³ International Center for Biosaline Agriculture, Dubai, UAE

INTRODUCTION

Quinoa is a revenue-generating crop that has the potential to improve the livelihoods of poor smallholder farmers in areas with extreme soil and climatic conditions. As such, it is well suited for addressing income challenges faced by smallholder farmers in marginal regions of Morocco. The Quinoa (*Chenopodium quinoa* Willd) has been introduced in Morocco for its nutritional qualities, its resistance to various stresses and its potential to improve cropping systems. It is a promising crop for food security in arid and semi-arid zones, it adapts quickly to different climatic and soil conditions. The objective of this study is to evaluate the effect of different organic amendments (manure and compost) doses on two quinoa accessions, which are ICBA-Q3 (variety developed by ICBA introduced for the first time in Rehamna), and a mixture of accessions (locally cultivated in Rehamna).

MATERIALS AND METHODS

This experiment was conducted in the experimental farm of Mohamed VI Polytechnic University located in Ben Guerir from January to June 2018. Two quinoa lines were tested, ICBA-Q3, and a mixture of accessions (Locally grown in Rehamna), applying six treatments of organic amendment in a split plot design with 3 repetitions.



Table 1: Applied treatments.

Treatment	Organic Amendment Dose	Type
T1	0t/ha	Compost
T2	5t/ha	
T3	10t/ha	
T4	20t/ha	
T5	10t/ha	Fumier
T6	20t/ha	
T7	40t/ha	

RESULTS

Agronomic parameters

Data related to plant parameters showed that ICBA-Q3 accession recorded higher values compared to locally cultivated line (Fig. 1). However, there was no significant difference between tested lines for panicle length and diameter and harvest index. While organic amendment affected positively most of monitored parameters. The height at maturity was ranging between 131 and 153.50 cm for Q3, and between 95.05 and 109.3 cm for the locally cultivated accession. Dry matter production was between 43.66 g and 75.62 g for the locally cultivated accession and between 94.61 g and 137.94 g for ICBA-Q3. Plant height, biomass production, root size, yield, and seed weight for both varieties were highly responding to organic amendment increase. Based on an estimated potential yield (2.60 t/ha), the locally cultivated accession was found to be less adapted to site conditions and amendment than the ICBA-Q3 accession (4.4 t/ha).

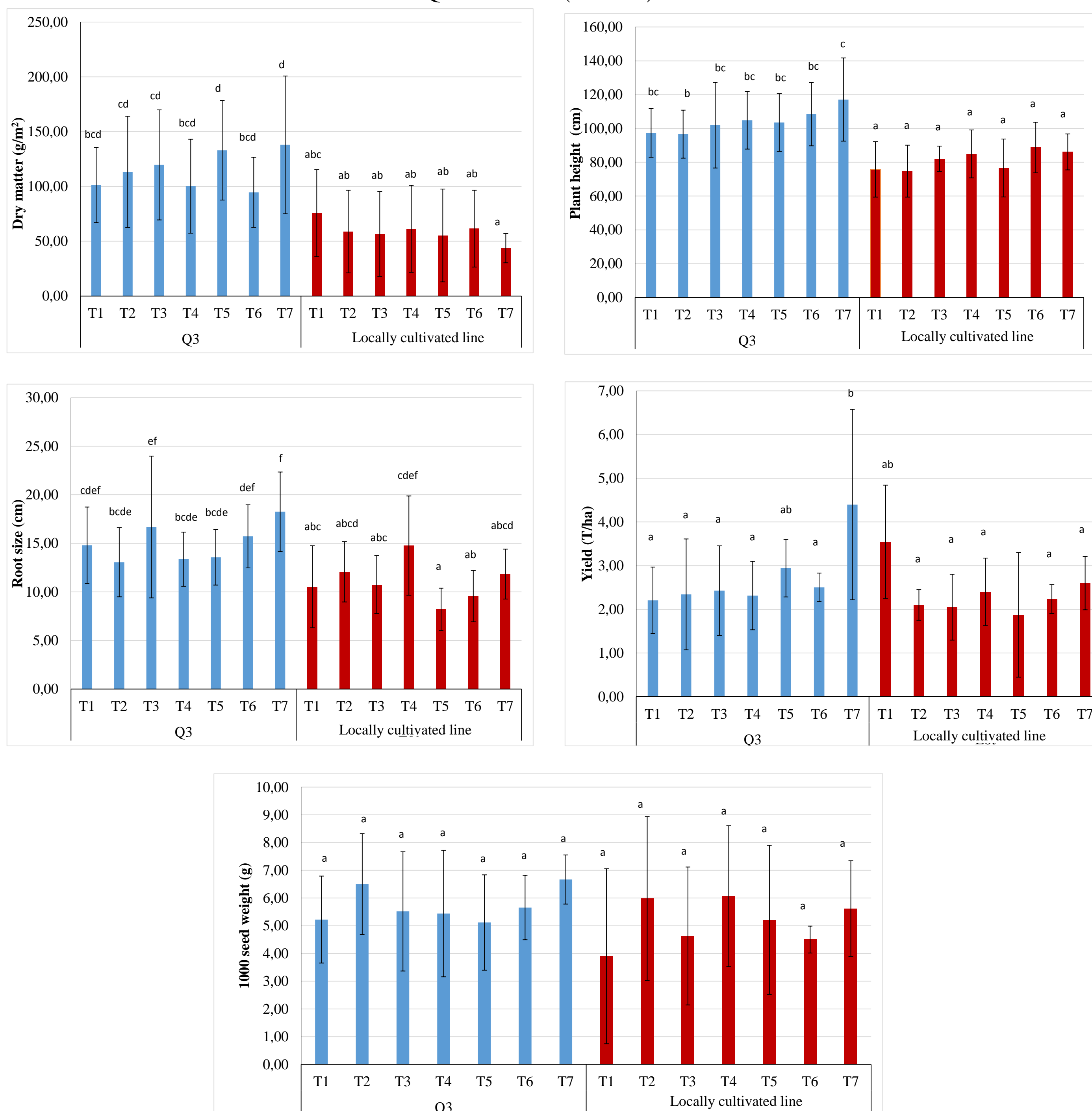


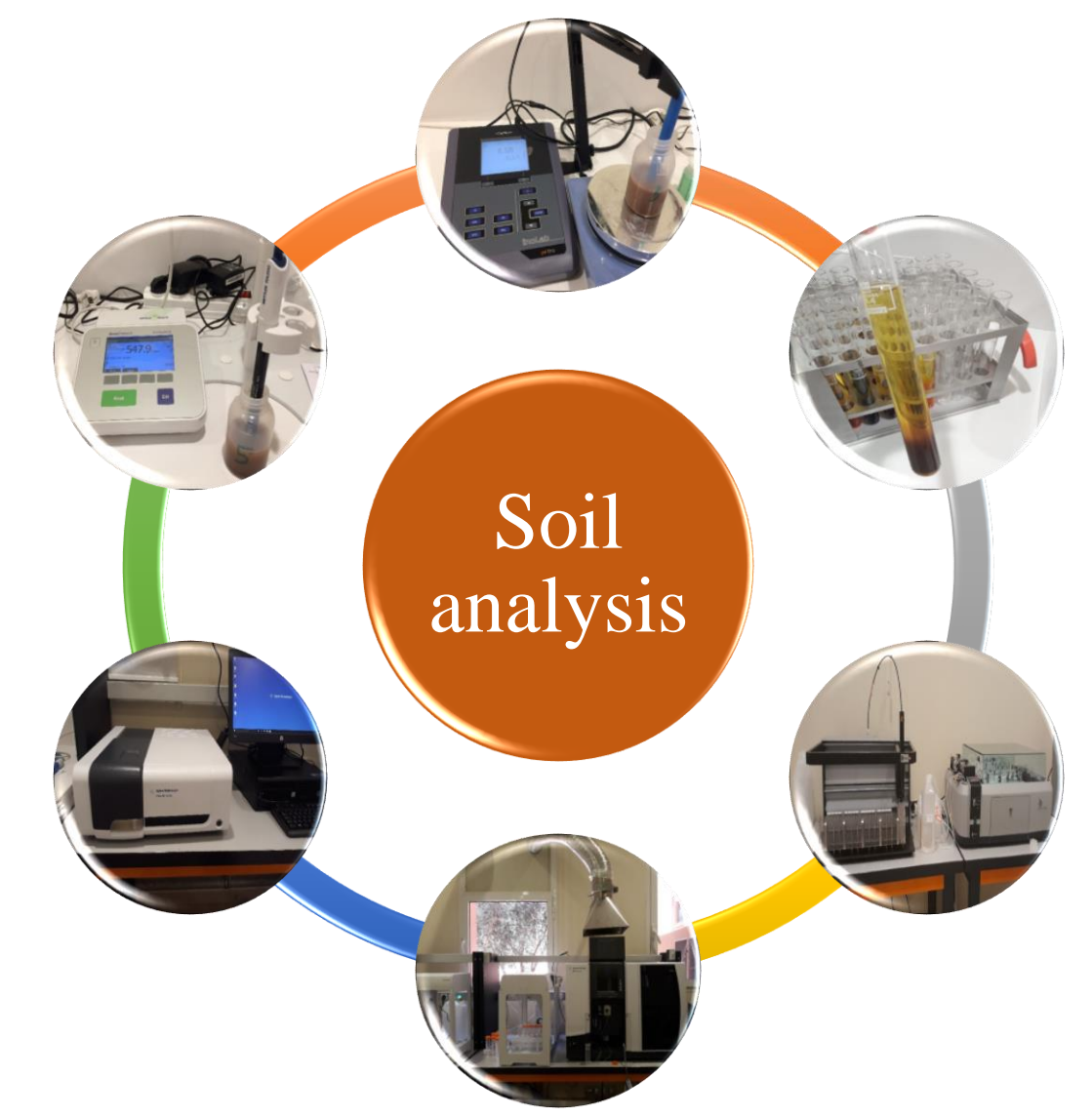
Fig. 1. Effects of organic amendment on agronomic parameters

Soil Parameters

The analysis are carried out in the laboratory soil-water-plant of Mohamed VI Polytechnic University. The physicochemical analysis of soils have shown that the experimental site soil have low levels of organic matter 1.5% , with a low EC equal to 0.1 ms/cm, and moderately basic pH equal to 8.4. The soil texture is clay with 52.9% clay, 24.9% sand and 22.2% silt (Table 2). The nutrient analysis of the soil shows that it has medium to high content of phosphorus (17.8 to 64.03 ppm), and high contents of potassium (200 to 700 ppm) after the addition of the amendments at different doses.

Table 2 : soil analysis

Parameter	Value	
Phosphorus mg/kg	32	
CEC meq/100g	23.45	
Nitrogen %	0.2	
Potassium K ₂ O mg / kg	578.5	
Organic matter (%)	1.675	
EC (mmhos/cm)	0.105	
Granulometry (%)	Coarse sand	11.05
	Fine sand	13.25
	Coarse silt	10.75
	Fine silt	12.4
Clay	52.9	
Total limestone %	0,2	
pH	8.45	



Correlations variables and treatments

For the ICBA Q3 variety, highly significant correlations were observed between organic amendment doses and most of investigated parameters. Data indicate that monitored parameters responded well to increased manure dose compared to compost (Fig. 2). Plant height was the most correlated to increased manure dose while 1000 seeds weight was the most correlated parameter to increased compost doses.

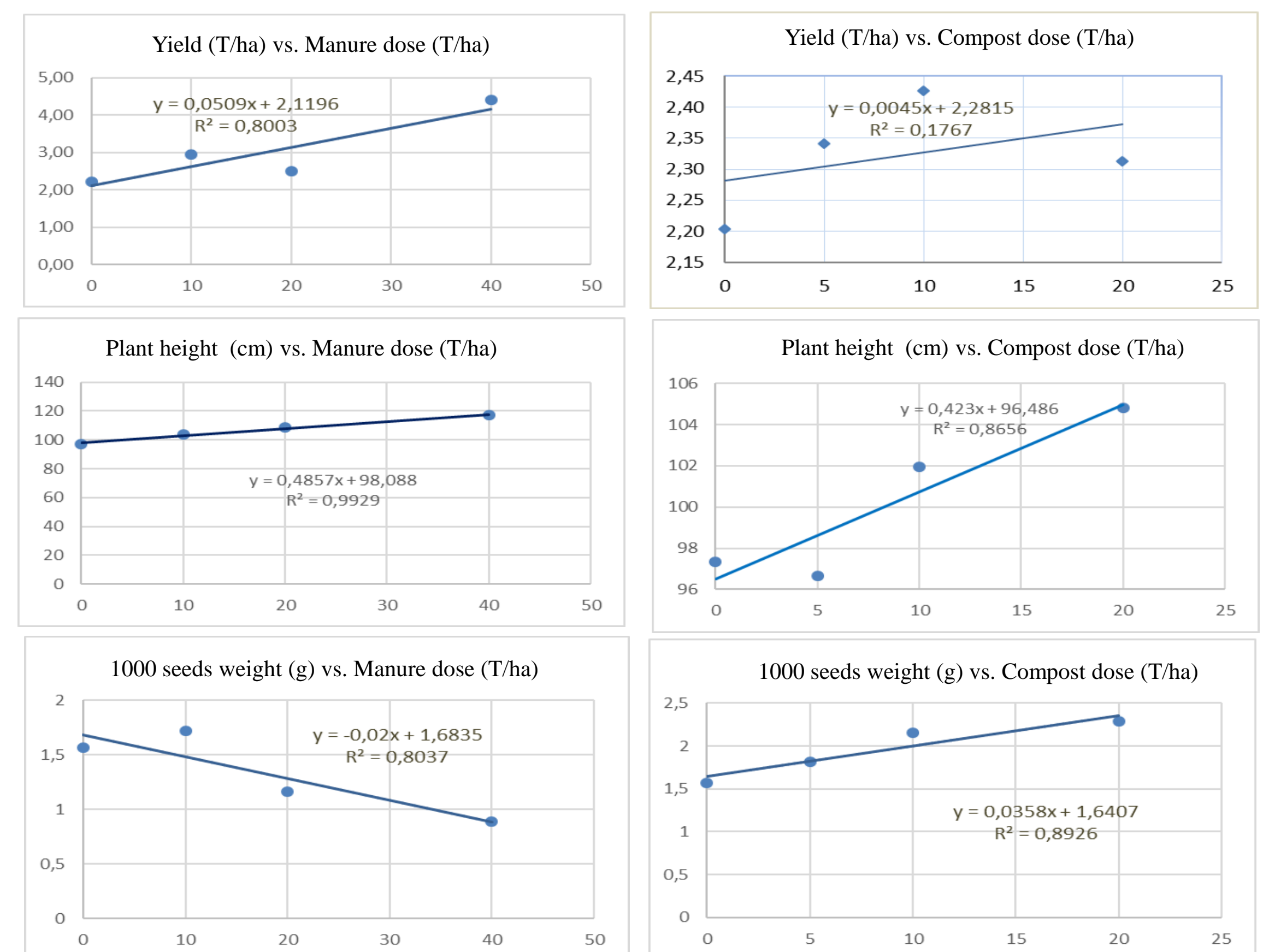


Fig. 2. Correlation variables and treatments for ICBA Q3 line

For the locally cultivated line, obtained data show a weak positive linear relationship between organic amendment for most of investigated variables (yield, height and weight of thousand seeds). Presented data indicate clearly that the locally cultivated line have not well responded to the organic amendment dose increase compared to ICBA-Q3 line (Fig. 3).

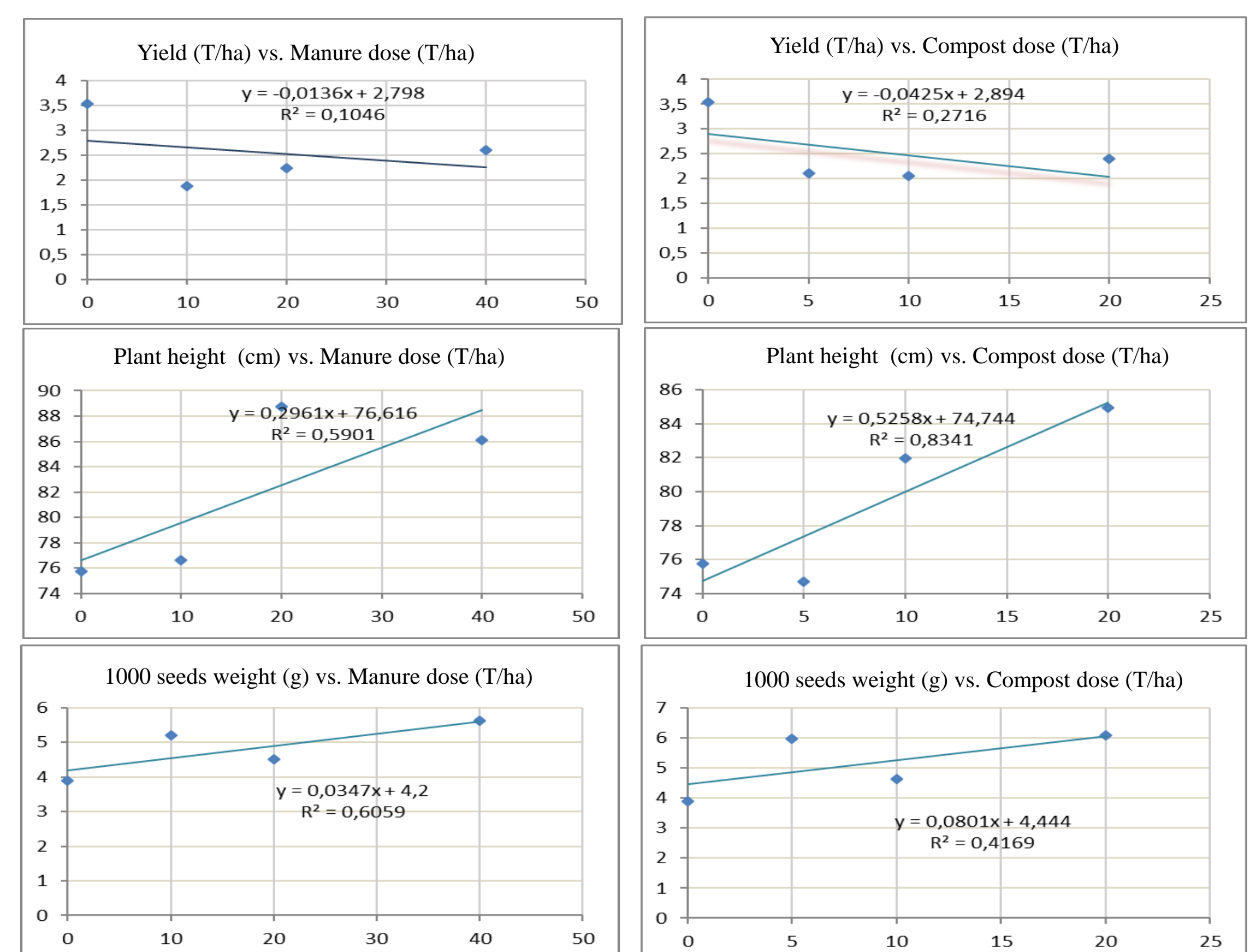


Fig. 3. Correlation variables and treatments for the locally cultivated.

CONCLUSION

The finding of this study clearly indicates that organic amendment have positive effect on quinoa growth and productivity and more specifically better results were found under manure application. Therefore, applying cow manure is recommended for quinoa for a double benefit, increasing yield and reducing production cost (compared to compost). The finding shows clearly that ICBA-Q3 line has a great potential to replace locally cultivated lines thanks to its high performance. Thus, more works are needed to test several sowing dates for this line and further scaling-up.