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Organic composition of IRSSTN genotypes rice evaluated under Iraqi climate

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Abstract
The healthy situation in rice-consuming countries varies fundamentally depending upon a web of interfacing monetary, developmental, social, common and dietary components. Despite the area, most rice-subordinate economies have high people advancement rates, low rice yields. Rice has high imperativeness sustenance, absorbable sugar, protein, supplement fundamental for human. Field experiment was conducted to evaluate the different genotypes of IRSSTN Rice and their effect on inorganic and organic content in two set of rice (model 1, 2). Among the nutrients; the content of K and Ca have more significantly in IRSSTN-2 compared with IRSSTN-1, but the contents of P, Mg, and Na in polish grain was less significant in IRSSTN -2 compared with IRSSTN -1. The micronutrient content in polish grain IRSSTN -1 was highly significant in Fe, Cu, Mn, Zn compared with IRSSTN -2. Then again, the most elevated connotation substance of slag, moistness was found in clean seed of IRSSTN - 2 genotypes while IRSSTN - 1 have more noteworthy in sugar and arginine, However, the similar behavior was found in IRSSTN -1; 2, but these differences appeared to present only small changes in the overall score of general acceptability of the foods. So the possibility of using these biochemical characteristics as selection criteria for salt tolerance is discussed

Keywords: AMRRS, protein, fiber, ash, macro-micronutrient

Introduction
Rice geneticists and physiological processes have been able to increasing salt tolerance in varieties of rice (FAO, 2008) [8], in spite of the quality rice food is conferred remains unclear (Djanaguiraman *et al.*, 2006; Moradi and Ismail, 2007; Cha-um *et al.*, 2007; 2009; Hasamuzzaman *et al.*, 2009) [13, 4, 6, 9]. salt stress during plant developed stages are affected upon photosynthesis, protein synthesis, fiber, amino acids, energy and lipid metabolism in the photosynthetic area available to support continued plant growth (Joseph *et al.*, 2013) [10]. Genetic diversity is always one way in the nutrition alone, does not guarantee increased nutrient quality levels, which they have focused all experiments on breeding of higher-yielding varieties rather than nutrient content. However, plant genetics, soil type and soil quality, growing temperatures, moisture levels, and other Iraqi climatic differences and pests can all affect the total nutrient content of grains at time of harvest. IRRI had helped to improve the quality and quantity of rice production, 831 million ha of the world's total area 12.78 billion ha is affected by salt in soils (FAO, 2008) [8]. In Iraq we collaboration with the International Rice Research Institute (IRRI), to understand this cellular function, a total of 92 genotypes obtained from IRRI (31^{st} IRSSTN-SS1 and 31^{st} IRSSTN-SS2) were subjected to field experiment of salinity stress (50 mM NaCl, Ece=6dsm^{-1}). A field experiment was conducted to study the extent of genetic diversity in rice for organic composition. The major salinity was emphasized in various aspects of photosynthesis (Cha-um and Kirdmanee, 2010) [5], various physiological processes such as reduction in amylose contend and starch in Nineteen rice genotypes tolerance to salt response were evaluated at the Central Soil Salinity Research Institute (CSSRI), Karnal, Haryana in northern India (Surekha *et al.*, 2013) [19]. Barus *et al.*, (2015) [3] was tested 30 varieties of Rice in effect of salinity stress for improved some morphological traits and of and production showed that genotif IR 42 had the best growth and production as compared with other genotif. 30-50% of Yield are losses due to salinity and will result in reduced chlorophyll content (Saeedipour, 2014) [15] and early flowering was induced by salt stress (Joseph and Mohanan, 2013) [10], also Free and bound total phenolic concentrations, antioxidant capacities, and profiles of proanthocyanidins and anthocyanins in

whole graij rice, grain filling of rice (Tang *et al.,* 2009) [20]; mineral composition of rice (*Oryza sativa* L. ssp. *indica*) growth properties (Saleethong *et al.*, 2013) [17]. The objectives of this study were to determine the variability of two set of IRSSTN rice in organic compassion to Iraqi condition.

Material and Methods

Two sets of Two modules of International Rice Soil Stress Tolerance Nursery (IRSSTN); "IRSSTN Module 1" for Coastal Salinity- Wet season and "IRSSTN Module 2' for Inland Salinity- Coastal salinity-Dry season was obtained from International Rice Research Institute, (IRRI) were evaluated at Al-Mishkhab Rice Research Station (AMRRS) during 2013. IRSSTN Module 1 consisted of 35 test entries which are tall (110-130 cm) and medium height with late-maturity (> 130 days). This module was evaluated under coastal –saline soil conditions. IRSSTN Module 2 is composed of 35 test entries that are semi-dwarf to medium-tall (<110 cm) with early to medium maturity (<125 days). This module was screened under inland-saline soil conditions. The soil texture of the application areas was silt clay loam to clay loam with pH of 7.9 and EC of 6 ds/m(field soil analysis) in Randomized Complete Block Design (RCBD) with three replications. Twenty six days old seedlings were transplanted in 2 m2 plot with inter-row and intra-row spacing of 20 × 15 cm. All recommended practices were followed to maintain uniformity in plant population and to ensure good crop growth.

The parameters measured during period study, and nutritive value in terms of minerals of K, Ca, Mg, Na, Zn, Mn, Cu, and Fe. One grams of tissues form each replicates were dried in an oven for 24 h at 105°C (weighed and re-weighed until a constant weight was reached). The samples were then allowed to cool at room temperature before the final weight was taken. The contents of the mineral elements for K, Ca, Na, Mg, Mn, Zn, Cu and Fe were determined using the standard method (aqua regain digestion method) and analyzed by Atomic absorption spectroscopy (AAS), Method at described by Page (1982). The chemical composition of triplicate plant samples were grounded and analyzed for moisture content, ash, protein (the total protein content was determined by the Kjeldahl method (a nitrogen conversion factor of 5.95)), and fat as per the methods of AOAC (2004) [1]. Data were analyzed using the SAS 1999 [18] software and means were separated using the stander error (SAS, 1999) [18].

Results and Discussion

Inorganic composition

Polish IRSSTN Module 1 genotypes rice significant differences between them for all inorganic composition evaluated (figure 1). Polish seeds of genotypes were positively accumulation with the P, K, Mg, Na and Ca content, the highest P content was reached 3416.23 mg kg^{-1} in IR71895-3R-9-3-1 genotype while the lowest content was in IR72049-B-R-22-3-1-1 genotype reached 28.03 mg kg^{-1}. The K content varied from 701.4 to 401.4 mg kg^{-1} and the Mg between 1225 to 681.2 mg kg^{-1} and the Na from 225.6 to 65.68 mg kg^{-1}; Ca from 42 to 14 mg kg^{-1}.

In the IRSSTN Module 1 genotypes the Cu content varied from 8.497 to 1.459 mg kg^{-1} for IR75395-2B-B-19-2-1-2 and IR50184-3B-18-2B-1 respectively (figure 1). On other hand, the high Mn content of 38.47 mg kg^{-1} for IR77664-B-25-1-2-1-3-12-3-AJY1 and low Mn content 1.309 mg kg^{-1} for IR77674-3B-8-2-2-14-2-AJY1; Zn content was 38.22, 37.16 and 34.97 mg kg^{-1} for IR07T114, IR71999-3R-3-2-2B-1-1 and IR71907-3R-2-1-1 respectively. Fe was ranged from 592.9 mg kg^{-1} (IR71866-3R-1-2-1) and 25.26 mg kg^{-1} (IR51499-2B-29-2B-1-1). Study suggested that salt stress tolerant genotypes maintained higher concentration of macro and micronutrient that showed superior physiological and biochemical traits. Osmotic damage could occur as a result of build up of high concentrations of Na+ in the leaf apoplast, since Na+ enters leaves in the xylem stream and is left behind as water evaporates (Joseph *et al.,* 2013; Kshirsagar *et al.*, 2014) [10, 11].

The analysis of our data indicated that the IRSSTN Module 2 genotypes rice significant differences between them for all macro-micronutrients evaluated (figure 2). The Cu content was 6.54, 1.991mg kg^{-1} for IR 77 674B20121364AJY1 genotypes and IR 681 442B2233 genotypes respectively. The Mn content varied from 26.43 to 3.935 mg kg^{-1} for IR 77 6743B822134AJY2 genotypes and IR 77 6743B822144AJY1 genotypes and the Fe between 170 (IR 10T 101 genotypes) to 24.42 (IR 10T 102 genotypes) mg kg^{-1}; the Zn from 15.63 for IR 7409 5AC45 genotypes to 9.073 for IR 10T 101 genotypes.

In the IRSSTN Module 2 genotypes (figure 2) the P content was 900.61 mg kg^{-1} to 37.06 for A 691and IR 725 79B2R132 genotypes also the K content was 747.6 (IR 681 442B2233 genotypes) and 345.1 (IR 725 93B18222 genotypes) mg kg^{-1} respectively. Mg was ranged from 1095 mg kg^{-1} (IR 77 674B20121364AJY1 genotypes) and 737.3 mg kg^{-1} (A 691 genotypes). On other hand, the Na content varied from 271.6 mg kg^{-1} to 75.89 mg kg^{-1} for IR 77 6743B822144AJY1 genotypes and IR 77 644B93321152AJY4 genotypes respectively. The Ca content ranged from 87 mg kg^{-1} (IR 77 6743B822134AJY2 genotypes) to 17 mg kg^{-1} (IR 725 79B2R132 genotypes); the N between 1.92 mg kg^{-1} (IR 7409 5AC45 genotypes; IR 10T 101 genotypes) to 1.42 mg kg^{-1} (IR 77 644B93321152AJY4 genotypes). Although whole plant mechanism can contribute to the avoidance of stress during the plants life cycle, tolerance can also occur at the cellular level. Plants are either dormant during the salt episode or there must be cellular adjustment (Djanaguiraman *et al.,* 2003; Barus *et al.,* 2015) [7, 3]

Organic composition

Organic composition in IRSSTN Module 1 genotypes has been detected and results showed in figure 3. Ash, protein, fiber, humidity, carbohydrate, sugar and Arginine in the rice polish seed is analysis for food quality, However, high ash of 1.46% was observed in IR73055-8-1-1-3-1 and 1.28 in IR65833-4B-17-1-3 and IR50184-3B-18-2B-1, while low ash of 0.36% was showed in IR61919-3B-24-3 and IR77674-3B-8-2-2-14-2-AJY4. The lowest ash content was found in IR71999-3R-3-2-2B-1-1 compared with author genotypes.

Protein induced by salinity are cytoplasmic which can cause alterations in cytoplasmic viscosity of the cells. Protein content also has been showed in figure 3. The protein content ranged from 11.6 to 6.8% in genotype (IR77674-3B-8-2-2-14-2-AJY1 and IR72048-B-R-16-2-3-3) also among of the genotypes was closer to ≤.8%. Fiber content in IRSSTN Module 1 genotypes ranged from 0.88 to 0.08% (IR50184-3B-18-2B-1 and IR77674-3B-8-2-2-14-2-AJY4), however more than 50% from IRSSTN Module 1 genotypes were closer to 0.5%. Humidity was more uniformly throughout mature plants than other seeds content. In our study, the content of humidity reached more than 10% in IR72048-B-R-16-2-3-3, IR75395-2B-B-19-2-1-2, and IR73055-8-1-1-3-1 while more than 80% from genotypes were less than 10%.

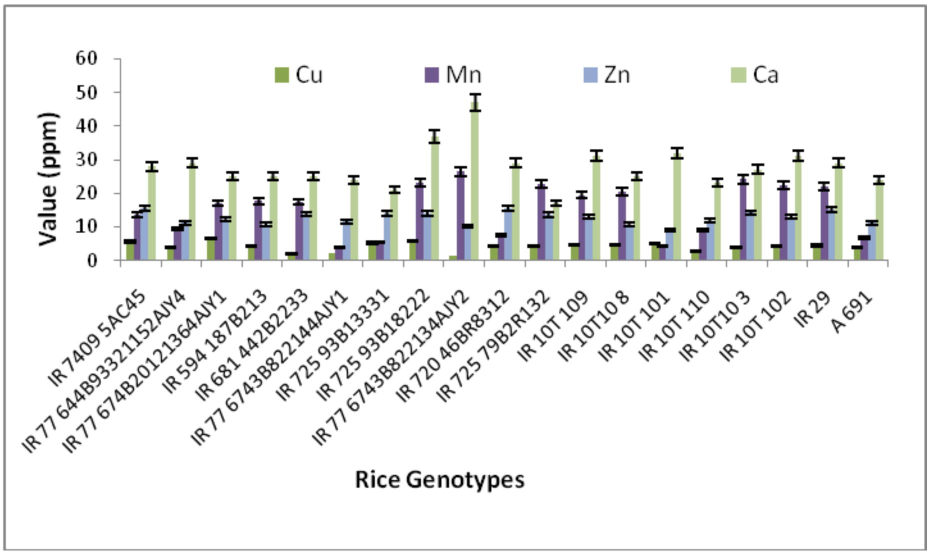
Sugar content varied between 17.5 to 3.97% was IR50184-3B-18-2B-1 and IR77664-B-25-1-2-1-3-12-4-AJY1 genotypes respectively, also carbohydrate content were between 85.10 and 36.10% and arginine content were between 6.144 and 4.544%.

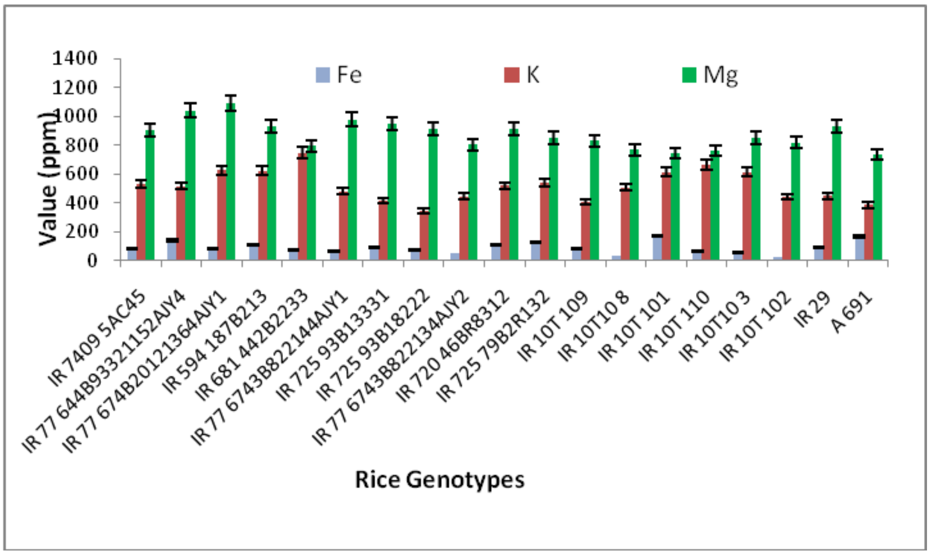
Late vegetative growth of IRSSTN Module 1 genotypes (> 130 days) has more tiller production and more panicles with more spikelet per panicles that inverse behavior on organic composition. This organic compound is mainly localized in chloroplasts and plays a vital role in chloroplast adjustment and protection of thylakoid membranes, thereby maintaining photosynthetic efficiency and plasmamembrane integrity (Saleethong *et al.*, 2013; Saeedipour, 2014) [17, 15].

Protein, ash, fiber, humidity, sugar, carbohydrate and arginine content in IRSSTN Module 2 genotypes also have been showed in figure 4. The protein content similar behavior of nitrogen, varied from 12% (IR 7409 5AC45 genotypes; IR 10T 101 genotypes) to 8.9% (IR 77 644B93321152AJY4 genotype). High ash content was found IR 10T 101 genotype (1.52%) and low content was found IR 10T10 genotype. High fiber of 0.82% was observed in IR 77 6743B822134AJY2 genotype and 0.76 in IR 720 46BR8312 genotype, while low fiber of 0.12% was showed in IR 10T10 8 genotype. The lowest humidity content (8%) was found in A 691 genotype compared with author genotypes (≤.8%).

Sugar content in IRSSTN Module 2 genotypes ranged from 9.77 to 4.68% (IR 10T 109 and IR 725 79B2R132), however more than 50% from IRSSTN Module 1 genotypes were closer to 7%. Carbohydrate was reached more than 80% in IR 725 93B18222, IR 10T 109, IR 10T 101, IR 10T 102 and A 691 genotype. Arginine content varied between 5.376 to 3.456% was A 691 and IR 10T 109 genotypes respectively.

Salt stress responses of plants depend upon salt structure, level, and genotype. Therefore, in ensuring future crop production we must screening for salt-stress tolerant genotypes in rice. In addition, studying differential responses of genotypes with contrasting stress tolerances will help reveal the underlying salt stress tolerance mechanisms and biochemical parameters might have played an important role in its salt tolerance nature. The proteins that accumulate under salt stress and a correlation has been found between greater accumulations of stress proteins in halotolerant, compared to salt-sensitive rice genotypes (Chourey *et al.* 2003; Wickramasinghe *et al.*, 2008 ; Kumar *et al.* 2009; Hasamuzzaman *et al.*, 2009; Cha-um *et al.*, 2007; 2009; Sakina *et al.*, 2015) [21, 9, 4, 6].





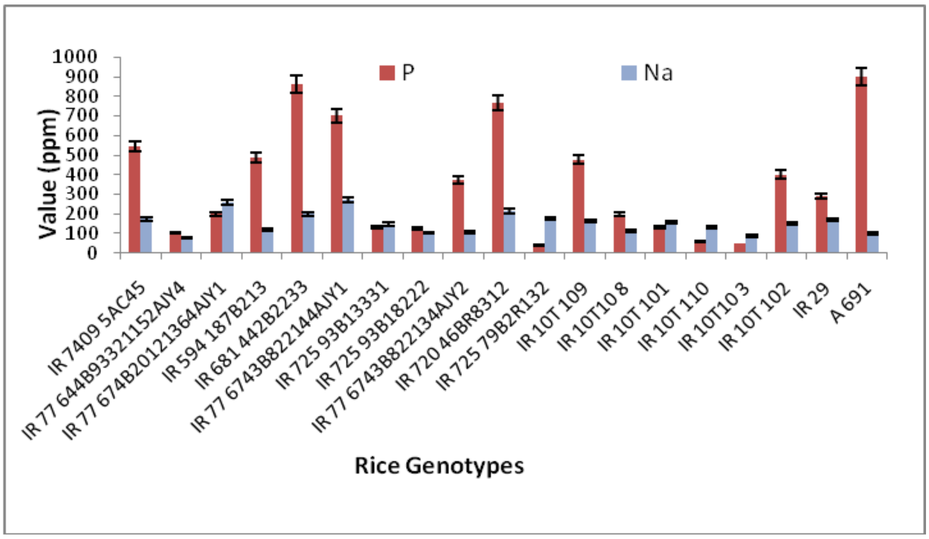
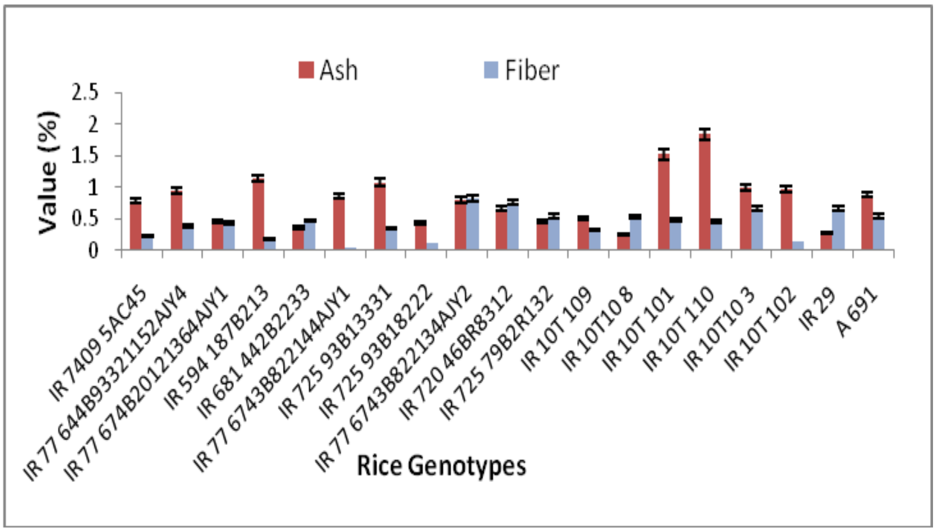
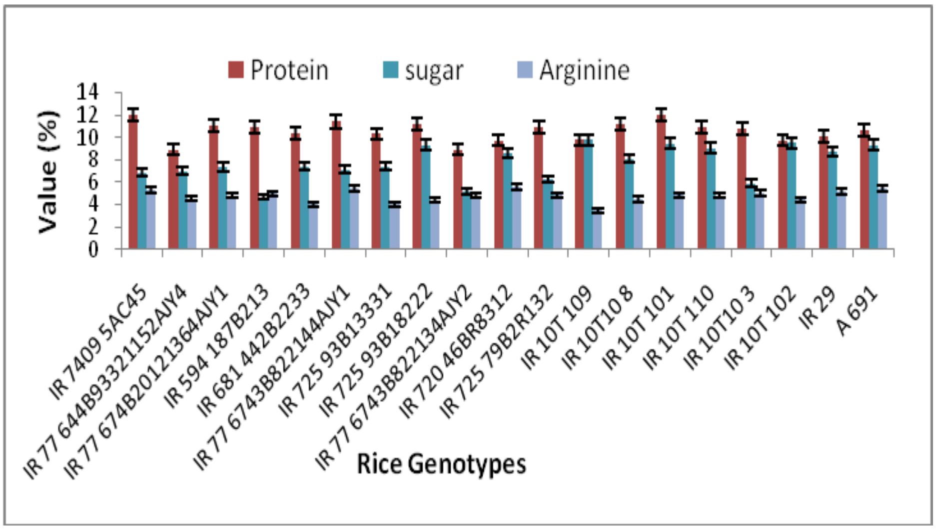


Fig 1: Average Macroelements and Microelements content of polish grain dry Rice scores of entries in the IRSSTN MODULE 1.





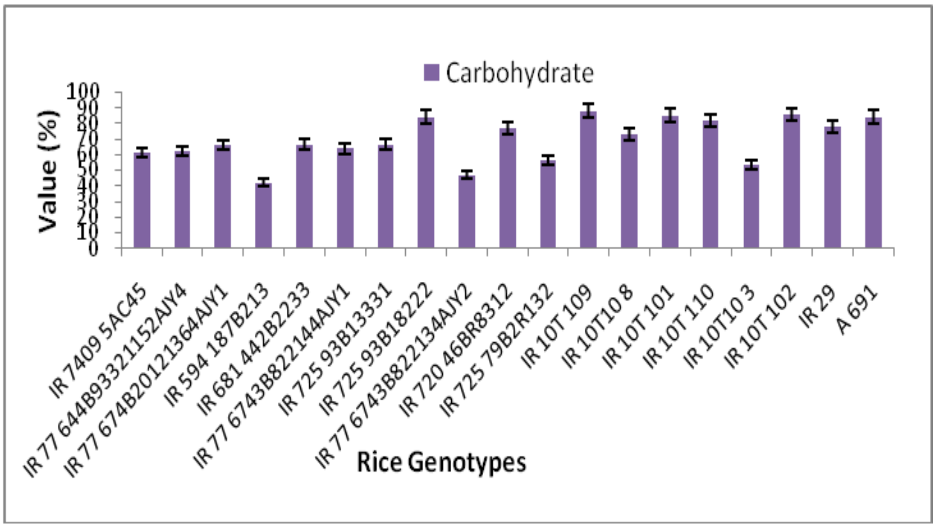
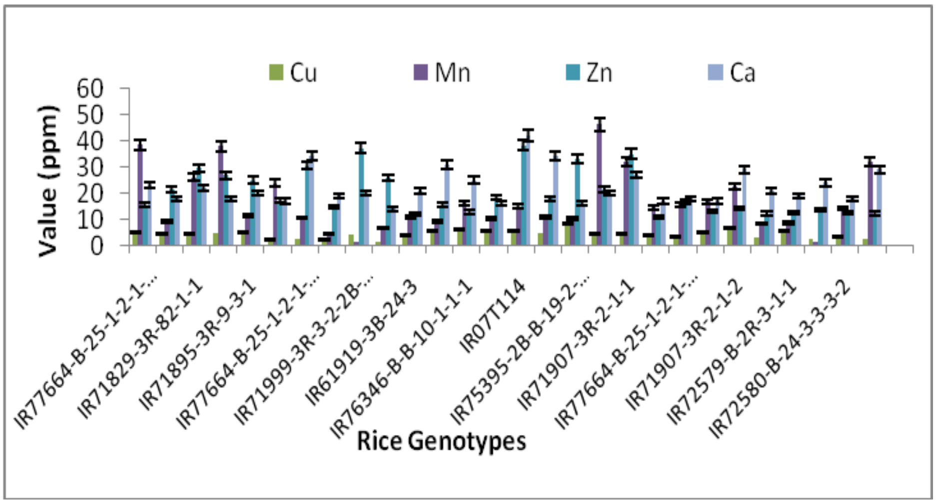
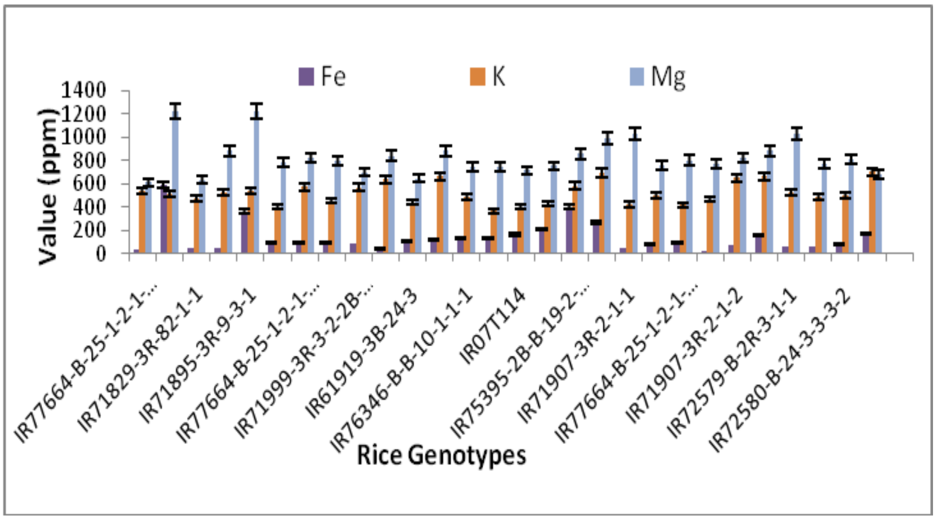


Fig 2: Average organic composition content of polish grain dry Rice scores of entries in the IRSSTN MODULE 1.





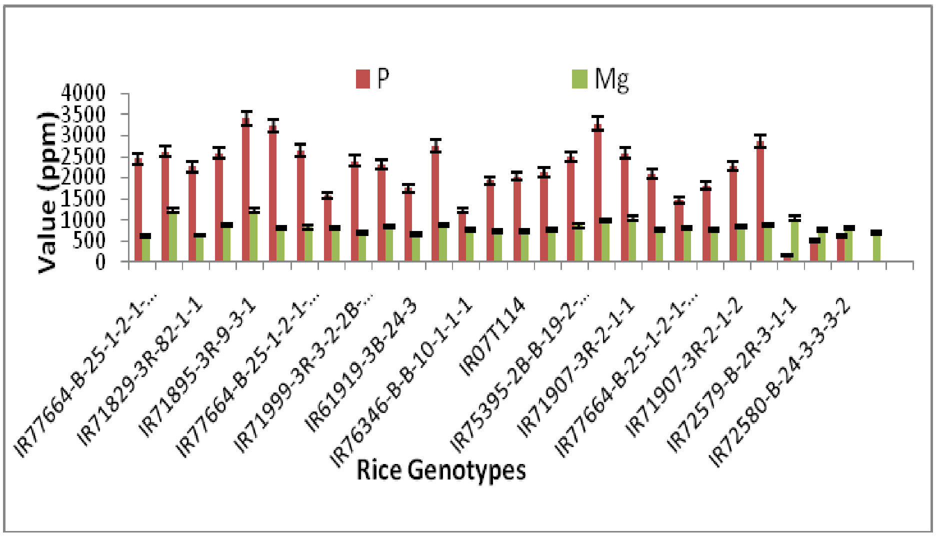
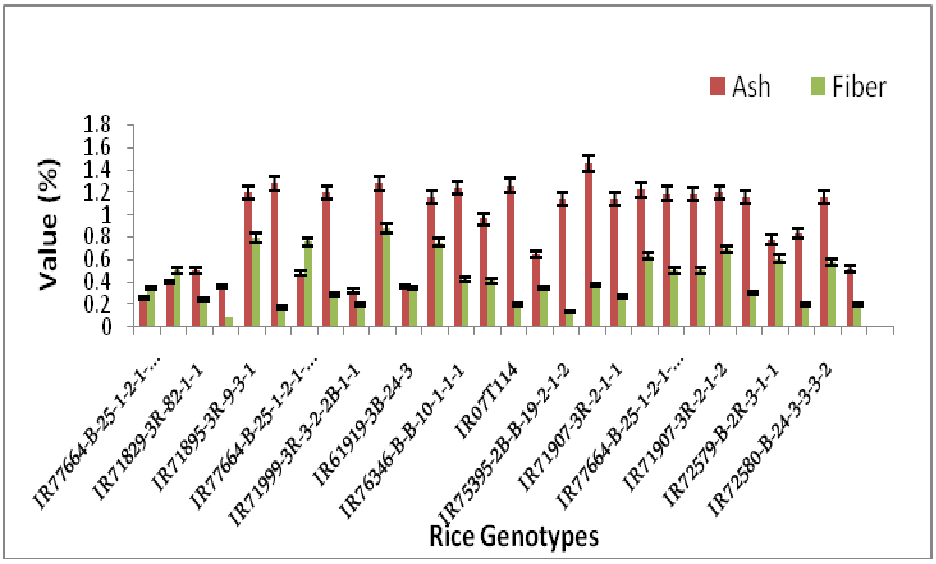
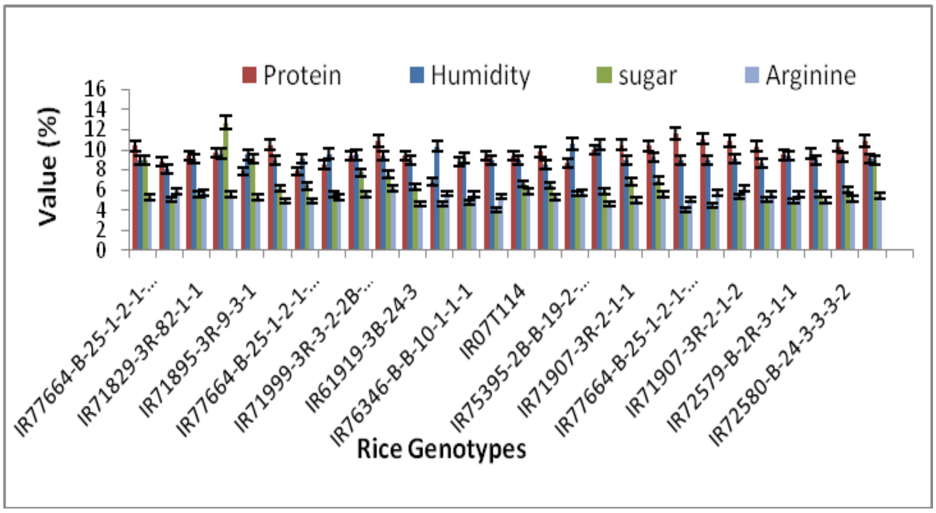


Fig 3: Average Macroelements and Microelements content of polish grain dry Rice scores of entries in the IRSSTN MODULE 2.





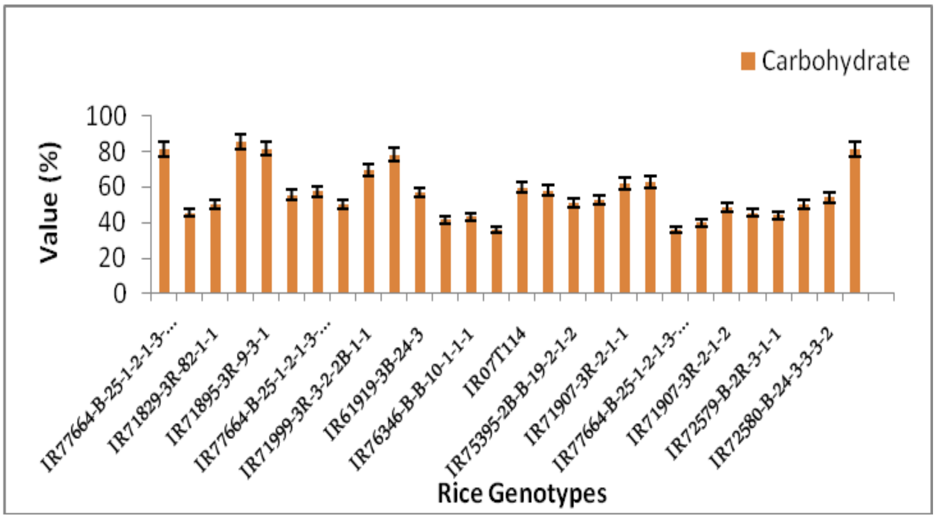


Fig 4: Average organic composition content of polish grain dry Rice scores of entries in the IRSSTN MODULE 2.

Conclusion

IRSSTN genotypes of rice has a good food parameterizes show significant differences with the IRSSTN model 1 and 2genotypes under Iraqi condition. Rice is one of the oldest grains has fed millions of Iraqi people can provide a unique source of nutrients and functionality. IRSSTN genotypes that may be good results can be promise rice we can culture in salinity condition with good food value. There were no significant differences between the all 19 genotypes for IRSSTN model 1 and 28 genotypes for IRSSTN model 2.

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