

## Research Article

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# Effect of salt stress on the biochemical characteristics of selected wheat varieties

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### Abstract

Salt stress is one of the vital stresses consequential in decrease the yield and component of various crops including wheat (*Triticum aestivum* L.). Current practical was conducted to determine best variety of wheat (*T. aestivum* L.) for Charsadda under saline condition. The consequence caused by salt stress on the biochemical constituent (moisture, ash, crude fiber, crude fat, carbohydrates and protein) of five different varieties of wheat seeds grown under high artificial NaCl stress. During time period of sowing-harvesting different doses of NaCl were given to the plant. Result of approximate analysis showed reduction in moisture, ash, crude fiber and fat contents with increase in NaCl stress, while protein and carbohydrates contents increased with increase in salinity. On the base of percentage difference between control and 58g (higher concentration) Sahar and Siran varieties were less effected by NaCl stress in 4 out of 6 constituent even at 58g (higher concentration) as compare to the Ta-Habib, galaxy 2013 and Janbaz.

**Keywords:** Salinity; Wheat; Proximate

### Introduction

#### Area back ground

Study area is located in the west of the Khyber Pakhtunkhwa and is bounded by Malakand district on the north. Mardan district on the east, Nowshera and Peshawar district towards the south while Mohmand Agency of the Federally Administrated Tribal Areas on the West. The district lies between 34-03 and 34-38 North latitude and 71-28 and 71-53 east longitudes.

Charsadda features a semiarid climate, with very hot summer and cooled winter. Winter

in Charsadda starts in a mid-November and ends in the late March, while summer months are May to September. The mean maximum summer temperature surpasses 40C (104F). The mean minimum temperature during winter is 4 degree centigrade minimum while maximum is 18.35 degree centigrade [1].

According to Censuses 1998 total population of Charsadda was recorded 1.626 million (1,626,000), with area 996 km<sup>2</sup> (385 square miles) and density is 1026/km<sup>2</sup> (2660/seq. mile). According to Geographic

centre Charsadda, the district is 282 meter above from sea level in elevation.

### **Wheat crop in district charsadda**

Saline stress alter the complete metabolism, physiological and enzymatic process, even it change the complete flexibility of a plant body [2, 3]. The strength of positive interactions increases with increasing stress except at the most extreme levels. In contrast, the strength of negative interactions is either unrelated to stress and remains consistently high, or alternatively, decreases with increasing stress [4]. Salt stress tolerance in plants is a complex phenomenon that may involve developmental process. Wheat (*Triticum aestivum* L.) is locally known as 'Ghundum'. It is grown world wise as Rabi (temperate) and is the leading word food crop so called 'king of cereals'. It is the major commodity in world food trade as it exceeds all cereals both in area and production. Due to its wide spread dissemination as food aid to developing countries wheat is considered as basic food stuff [5].

### **Materials and methods**

An area of 320 square feet was selected within the university. 25 plots of area 2 square feet were made in the selected area. All the plots were 2 feet apart from each other from all the four sides. The partition between the plots was 2 feet width and 1 feet height wise. The area was well protected from the rain and fog with the help of plastic canopy during rain and fog events. Molar solution of NaCl was made for stock, 58.44 grams per 1 litre of water, 8 time water was given to the field, for each time 136 litres of molar of solute per litre of solution) stock solution was made which consume 7.947 kg of, NaCl from stock then further 0.7, 0.8, 0.9 and 1 respectively concentration was made for treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> respectively, by using simple formula.

$$M_1V_1 = M_2V_2$$

V<sub>1</sub> = volume required from stock.

M<sub>2</sub> = required concentration.

V<sub>2</sub> = total concentration of required solution.

M<sub>1</sub> = Molarity of solute.

For  $V_1 = M_2 \cdot V_2 / M_1$

$$V_1 = 0.7 \cdot 10 \text{ Litre} / 1$$

$$V_1 = 7 \text{ Litre}$$

T<sub>1</sub> (0.7) concentration solution = 7 Litre (stock) + 3 Litre (water) (contain 409 g NaCl)

Same formula for T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> respectively given below:

T<sub>2</sub> (0.8) concentration solution = 8 Litre (stock) + 2 Litre (water) (contain 468 g NaCl)

T<sub>3</sub> (0.9) concentration solution = 9 Litre (stock) + 1 Litre (water) (contain 526 g NaCl)

T<sub>4</sub> (1) concentration solution = 10 Litre (stock) only (contain 584 g NaCl)

For each time 10 litre solution of salt was given to each plot.

Salt in grams per litre for T<sub>1</sub> (41g/litre), T<sub>2</sub> (47g/litre), T<sub>3</sub> (53g/litre) and T<sub>4</sub> (58g/litre).

Seeds were sown on 17 September, 2015 with first salt treatment, after that further salt treatment were given with the gap of 6, 12, 20, 20, 20, 20 and 8 days respectively. After two months wheat was harvested in the month of May, and then the seeds were collected manually and kept in plastic bags. Seeds were grinded fine for approximate analysis. The approximate analysis was performed in the Chemistry Lab under the supervision of laboratory superintendent.

### **Approximate analysis**

#### **For moisture content**

#### **Equipment's**

Oven, petri dish, 2g sample was taken.

#### **Procedure**

Weight of the petri dish (W<sub>1</sub>) and sample was taken before putting it into the oven. Place the petri dishes, partially covered in the oven for 4 hours to 6 hours at 105°C.

After 4 hours off the oven and let it to cool, after some time weighted  $W_2$  again.

#### **Applying the formula**

$$\text{Moisture content} = \frac{W_1 - W_2}{\text{Sample weight}} * 100$$

#### **For ash content**

##### **Equipment's**

Furnace Dish, Crucible and furnace.

##### **Procedure**

Weight the empty crucible  $W_1$  and put 2g sample in crucible, then put it in the furnace for 2 hours at  $550^\circ\text{C}$  highest temperature. After 2 hours off the furnace and let it cools. Then weight it  $W_2$  Weight of crucible + Ash in it.

#### **Applying the formula**

$$\text{Ash content} = \frac{W_2 - W_1}{\text{Sample weight}} * 100$$

#### **For crude fiber contents**

##### **Equipment's**

Beakers, Wash bath, NaOH, HCl, and titron filter, distilled water.

##### **Procedure**

Take 2 gram sample put it in the beaker. Put 2 percent NaOH solution of 200 ml in the beaker. Place the beaker on wash bath for 4 hours. Filter the mass after the 4 hours, take the filtrate in a beaker and put 200 ml (2% HCl solution) in the beaker and place it again at the wash bath for 4 hours. After that take the filtrate and put it in the crucible, and dry its moisture. For drying the moisture place the crucible again in the oven for 4 hours for  $105^\circ\text{C}$ . The moisture will be evaporated  $W_1$  weight the dish, and then put the crucible in the furnace for 4 hours at  $550^\circ\text{C}$  after that again weight  $W_2$  the crucible.

#### **Applying the formula**

$$\% \text{ of Crude fiber} = \frac{W_1 - W_2}{\text{Sample weight}} * 100$$

#### **For fat contents**

##### **Equipment's**

Soxhlet's apparatus. , Petroleum ether.

##### **Proceedure**

Take 1g sample fold it in the filter paper and then plant it into the inner coat of the timbal than fit the timbal in the Soxhlet's apparatus. Empty weight the beaker  $W_1$ . Then after that pore 50ml-60ml petroleum spirit or ether in the beaker of the Sothic's apparatus, fit it at the timbal holder and air tight it, then switch on the apparatus, and fix it at the 6<sup>th</sup> level. When the petroleum ether completely evaporates, recover the beaker and weight it again  $W_2$ .

#### **Applying the formula**

$$\% \text{ of Fat content} = \frac{W_2 - W_1}{\text{Sample weight}} * 100$$

#### **For protein contents**

##### **Material required**

1g sample,  $\text{K}_2\text{SO}_4$ ,  $\text{CuSO}_4$ ,  $\text{H}_2\text{SO}_4$ .

##### **Proceedure**

##### **Digestion**

Take the digestion flask put 1g sample, 7g  $\text{K}_2\text{SO}_4$ , 1g  $\text{CuSO}_4$ . 10ml-15ml  $\text{H}_2\text{SO}_4$  in the digestion flask, heat the flask up to greenish color, cold it then make the volume up to 100ml by putting distilled water in the flask. Pour the sample in a plastic bottle for distillation.

##### **Distillation**

##### **Equipment**

Jandal apparatus. Solution for one sample, 20ml Boric acid (4%), 2-3 drops indicator (methyl red), 10ml NaOH (40%), and 10ml sample "digested sample".

##### **Titration**

Fill buret with HCl 0.1% (4.41ml per 500ml). Note the initial and final reading in titration.

##### **Formula**

$$\text{Protein \%} = \frac{(S - B) * N * 0.014 * D}{\text{weight of sample} * \text{volume}} * 100$$

after that multiply the answer with nitrogen factor of wheat (6.25).

Where

S = sample reading

B = blank reading

N = normality of acid (0.1)

0.014 = milli equivalent weight of nitrogen

D = dilution factor (100 ml)

Weight of sample = 1 gm

Volume = 10ml.

#### For carbohydrate contents

Formula is used carbohydrates =100- percentage value of (Moisture, ash, Crude fiber, fat and protein).

#### Results

The percent germination of wheat revealed that maximum percent germination was found in Sahar Variety followed by Punjab

2010 variety (Table 1) Approximate analysis of wheat seeds was conducted to test the effect of salt stress on the biochemical composition of selected varieties (galaxy 2013, Ta-Habib, Sahar, Janbaz, Siran) of the *Triticum aestivum* L. different concentration of salts were applied as mentioned in the material and method chapter and the data were recorded.

**Table 1. Percentage of Germination of different varieties.**

Variety	Variety per area
Sahar	30%
Galaxy	8%
Janbaz	2%
Siran	1%
Ta- Habib	1%
Faisalabad	5%
Punjab 2010	15%
Pirsabaak	2%
Wheat Total	50%

#### Effects of salt stress on moisture contents of selected varieties of *T. aestivum* L.

The moisture content data were recorded which showed the dependent activity. The moisture contents were decreased with the increase in the salts concentration (Table. 2). Max reduced value showed by the 58g higher concentration i.e. 7% while less i.e. 11% was showed by the 41g lower concentration in the galaxy 2013 while control showed 12.5% moisture content. Similarly in case of Ta-Habib variety the lower concentration 41g showed 7.5% moisture content, while maximum decreased moisture content showed by the 58g higher concentration i.e. 5.9%, (Table. 2) control was at 9.1%. In case of Sahar variety the lower concentration 41g showed 9.15% moisture content while maximum reduction showed by the 58g higher concentration i.e. 8.15%, while control showed 10.95% moisture content. In case of Siran variety the lower concentration 41g showed 9% moisture content while maximum reduction

showed by the 58g higher concentration i.e. 7.3%, while control showed 9.2% moisture content. In case of Janbaz variety the lower concentration 41g showed 8.5% moisture content while maximum reduction showed by the 58g higher concentration i.e. 7%, while control showed 10% moisture content (Table 2).

#### Effects of salt stress on ash contents of selected varieties of *T. aestivum* L.

The ash content data were recorded which showed the dependent activity. The ash contents were decreased with the increase in the salts concentration. Max reduced value showed by the 58g higher concentration i.e. 6.2% while less 8.5% was showed by the 41g lower concentration in the galaxy 2013 while control showed 8.7% ash content. Similarly in case of Ta-Habib variety the lower concentration 41g showed 8.5% ash content, while maximum decreased ash content showed by the 58g higher concentration i.e. 6.75%, control was at 10.5% (Table. 2). In case of Sahar variety

the lower concentration 41g showed 9% ash content while maximum reduced value showed by the 58g higher concentration i.e. 8%, while control showed 10.35% ash content. In case of Siran variety the lower concentration 41g showed 8.7% ash content while maximum reduced value showed by the 58g higher concentration i.e. 7.15%, while control showed 9% ash content. In case of Janbaz variety the lower concentration 41g showed 8.5% ash content while maximum reduction showed by the 58g higher concentration i.e. 6%, while control showed 10.5% ash content (Table 2).

#### **Effects of salt stress on crude fiber contents of selected varieties of *T. aestivum* L.**

The crude fiber content data were recorded which showed the dependent activity. The crude fiber contents were decreased with the increase in the salts concentration. Max reduced value showed by the 58g higher concentration i.e. 5.15% while less 6.25% was showed by the 41g lower concentration, while control showed 7.55% crude fiber content in the galaxy 2013 Similarly in case of Ta-Habib variety the lower concentration 41g showed 6.8% crude fiber content, while maximum decreased crude fiber content showed by the 58g higher concentration i.e. 5.9%, control was at 7.87%. In case of Sahar variety the lower concentration 41g showed 6.7% crude fiber content while maximum reduced value showed by the 58g higher concentration i.e. 6.1%, while control showed 7.85% crude fiber content. In case of Siran variety the lower concentration 41g showed 10.9% crude fiber content while maximum reduced value showed by the 58g higher concentration i.e. 10%, while control showed 12.1% crude fiber content. In case of Janbaz variety the lower concentration 41g showed 8% crude fiber content while maximum reduction showed by the 58g higher concentration i.e. 6%, while control showed 10% crude fiber content (Table. 2).

#### **Effects of salt stress on fat contents of selected varieties of *T. aestivum* L.**

The fat content data were recorded which showed the dependent activity. The fat contents were decreased with the increase in the salts concentration. Max reduced value showed by the 58g higher concentration i.e. 6% while less 9% was showed by the 41g lower concentration in the galaxy 2013 while control showed 11% fat content. Similarly in case of Ta-Habib variety the lower concentration 41g showed 7.7% fat content, while maximum decreased fat content showed by the 58g higher concentration i.e. 5.9%, control was at 9.2%. In case of Sahar variety the lower concentration 41g showed 9.5% fat content while maximum reduced value showed by the 58g higher concentration i.e. 7.8%, while control showed 9.9% fat content. In case of Siran variety the lower concentration 41g showed 9.5% fat content while maximum reduced value showed by the 58g higher concentration i.e. 6%, while control showed 9.8% fat content. In case of Janbaz variety the lower concentration 41g showed 8.1% fat content while maximum reduction showed by the 58g higher concentration i.e. 6.8%, while control showed 9.8% fat content (Table 2).

#### **Effects of salt stress on protein contents of selected varieties of *T. aestivum* L.**

The protein content data were recorded which showed that protein contents were increased with the increase in the salts concentration. Max increased value showed by the 58g higher concentration i.e. 12.3% while less 9.63% was showed by the 41g lower concentration in the galaxy 2013 while control showed 7.88% protein content. Similarly in case of Ta-Habib variety the lower concentration 41g showed 11.4% protein content, while maximum increased protein content showed by the 58g higher concentration i.e. 14%, control was at 8.75%. In case of Sahar variety the lower

concentration 41g showed 7.88% protein content while maximum increased value showed by the 58g higher concentration i.e. 10.5%, while control showed 7% protein content (Table. 2). In case of Siran variety the lower concentration 41g showed 7.88% protein content while maximum increased value showed by the 58g higher concentration i.e. 15.8%, while control showed 7% protein content. In case of Janbaz variety the lower concentration 41g showed 7.88% protein content while maximum increased value showed by the 58g higher concentration i.e. 12.3%, while control showed 7% protein content (Table 2).

#### **Effects of salt stress on carbohydrate contents of selected varieties of *T. aestivum* L.**

The carbohydrate content data were recorded which showed that carbohydrate contents were increased with the increase in the salts concentration. Max increased value showed by the 58g higher concentration i.e. 63% while less 56% was showed by the 41g

lower concentration in the galaxy 2013 while control showed 52% carbohydrate content. Similarly in case of Ta-Habib variety the lower concentration 41g showed 55% carbohydrate content, while maximum increased carbohydrate content showed by the 58g higher concentration i.e. 62%, control was at 55%. In case of Sahar variety the lower concentration 41g showed 57.8% carbohydrate content while maximum increased value showed by the 58g higher concentration i.e. 59.4%, while control showed 54% carbohydrate content (Table 2). In case of Siran variety the lower concentration 41g showed 54% carbohydrate content while maximum increased value showed by the 58g higher concentration i.e. 63%, while control showed 53% carbohydrate content. In case of Janbaz variety the lower concentration 41g showed 58.5% carbohydrate content while maximum increased value showed by the 58g higher concentration i.e. 61.9%, while control showed 52.7% carbohydrate content (Table 2).

**Table 2. Effect of NaCl concentrations on Moisture, Ash, Fiber, Fat, Protein and Carbohydrate of various wheat varieties**

Variety	Galaxy-2013		Ta-Habib		Sahar		Siren		Janbaz	
	Control	Salt treated	Control	Salt treated	Control	Salt treated	Control	Salt treated	Control	Salt treated
<b>Moisture</b>	12.5	9.4	9.1	6.6	10.95	8.6	9.2	8.1	10	7.7
<b>Ash</b>	8.7	7.28	10.5	7.32	10.35	8.67	9	7.80	10.5	7.16
<b>Fiber</b>	7.55	5.75	7.8	6.42	7.85	6.43	12.1	10.54	10	6.87
<b>Fat</b>	11.0	7.50	9.2	6.78	9.9	8.57	9.8	8.77	9.8	7.38
<b>Protein</b>	7.88	11.0	8.75	13.0	7.0	9.0	7.0	12.0	7.0	10.0
<b>carbohydrate</b>	52	59.2	55	60.1	54	58.6	53	58.0	52.7	60.6

## **Discussion**

### **Moisture contents**

In the present study increasing the dose of salt (NaCl) stress reduced the moisture content by showing dependent activity. The moisture contents were decreased with increase in NaCl concentration. Maximum reduced value 7% showed by the 58g higher concentration, while minimum reduced value 11% was showed by the 41g lower

concentration in the galaxy 2013, control showed 12.5% moisture content. The result is in covenant to of Ghoulam *et al.* [6] in this respect that they performed an experiment of water uptake and plant-water relationships under saline growth conditions on Tomato plant. The result showed that Growth and water uptake both decreases when tomato plants are irrigated with saline water. Similarly in case of Ta-Habib variety



the lower concentration 41g give minimum reduced value 7.5% moisture content, while maximum decreased moisture content showed by the 58g higher concentration 5.9%, control moisture content was 9.1%. The result is in covenant to of [7] in this respect that they performed an experiment, Effects of salt stress on growth, inorganic ions and proline accumulation in relation to osmotic adjustment in five sugar beet cultivars. The result showed high NaCl concentrations caused a great reduction in growth parameters such as leaf area, and fresh and dry weight of leaves and roots, but the leaf number was less affected. These changes were associated with a decrease in the relative water In case of Sahar variety the lower concentration 41g showed 9.15% moisture content while maximum reduced 8.15% moisture content showed by the 58g higher concentration, and control showed 10.95% moisture content. The result is in agreement to those of Hernandez *et al.* [8] in this respect that they performed a NaCl stress experiment on pea plant. Their result showed both leaf water ( $\psi_1$ ) and osmotic potentials ( $\psi_s$ ) decreased progressively with the severity of the stress. In case of Siran variety the lower concentration 41g showed 9% moisture content while maximum reduced 7.3% moisture content showed by the 58g higher concentration, and control showed 9.2% moisture content. In case of Janbaz variety the lower concentration 41g showed 8.5% moisture content while maximum reduced moisture content 7% showed by 58g higher concentration and control showed 10% moisture content. The result is in agreement to the Khalil and Jan [9] in this respect that they performed an experiment of salinity against *Atriplex griffithii* var. *stocksii*. The result showed that water potential and osmotic potential of shoots became more negative with increasing salinity.

### Ash contents

Ash contents decreased with increase in NaCl concentration. Extreme reduced 6.2% ash content was exposed by the 58g higher concentration. Whereas fewer 8.5% was displayed by the 41g lower concentration which was near to the control ash content 8.7% in the galaxy 2013. Similarly in case of Ta-Habib variety the lower concentration 41g showed minimum effect 8.5% on the ash contents, but maximum decreased 6.75% ash content showed by the 58g higher concentration, while control was at 10.5%. In case of Sahar variety the lower concentration 41g showed 9% ash content while maximum reduced value 8% exhibited by the 58g higher concentration, although control showed 10.35% ash content. In case of Siran variety the lower concentration 41g showed 8.7% ash content while maximum reduced value 7.15% showed by the 58g higher concentration, whereas control showed 9% ash content. In case of Janbaz variety the lower concentration 41g showed 8.5% ash content while maximum reduction 6% occurred by 58g higher concentration. However control showed 10.5% ash content.

### Crude fibers contents

NaCl high stress adversely affects crude fibers content; by increased NaCl concentration crude fibers content were decreased. Maximum reduction 5.15% occurred at 58g higher concentration, whereas less reduction in fiber content 6.25% was showed by the 41g lower concentration, while control showed 7.55% crude fibers content in the galaxy 2013. Crude fibers content of the result is in agreement to those of [7] in this respect that they performed an experiment of salinity stress against wheat, the result shows that Salinity resulted in a significant reduction of the grain protein, fat and fiber contents. Similarly in case of Ta-Habib variety the lower concentration 41g showed 6.8% crude fibers content, however maximum decreased

5.9% crude fibers content showed by 58g higher concentration, but control was at 7.87%. In case of Sahar variety the lower concentration 41g showed 6.7% crude fibers content although maximum reduction 6.1% occurred at 58g higher concentration, while control showed 7.85% crude fibers content. In case of Siran variety the lower concentration 41g showed 10.9% crude fibers content while maximum reduced value 10% showed by the 58g higher concentration, but control showed 12.1% crude fibers content. In case of Janbaz variety the lower concentration 41g showed 8% crude fibers content while maximum reduction 6% crude fibers content showed by 58g higher concentration, whereas control showed 10% crude fibers content. Only crude fibers result is in agreement to those of [8] who performed an experiment of salt stress on sunflower (sumsang-600) their result showed that increased salt stress caused reduction in crude fibers percentage.

#### **Fat contents**

Like moisture, ash and crude fibers content fat contents were also decreased with the increase in the NaCl concentration. Maximum reduced 6% value showed by the 58g higher concentration, while minimum reduction 9% was showed by the 41g lower concentration in the galaxy 2013, whereas control showed 11% fat content. Similarly in case of Ta-Habib variety the lower concentration 41g showed 7.7% fat content, while maximum decreased fat content 5.9% showed by the 58g higher concentration, control was at 9.2%. In case of Sahar variety the lower concentration 41g showed 9.5% fat content while maximum reduction 7.8% fat contents occurred at 58g higher concentration, while control showed 9.9% fat content. In case of Siran variety the lower concentration 41g showed 9.5% fat content while maximum reduced value 6% showed by the 58g higher concentration, while control showed 9.8% fat content. In

case of Janbaz variety the lower concentration 41g showed 8.1% fat content while maximum reduced value 6.8% showed by the 58g higher concentration, whereas control showed 9.8% fat content. Fat content of the result is in agreement to those of [9] in this respect that they performed an experiment of salinity stress against wheat, the result shows that Salinity resulted in a significant reduction of the grain protein, fat and fiber contents.

#### **Protein contents**

Protein contents were increased with the increase in the NaCl concentration. Maximum increased protein contents 12.3% showed by the 58g higher concentration, while less 9.63% was showed by the 41g lower concentration in the galaxy 2013, whereas control showed 7.88% protein content. Only protein content of the result is in contrast to those of Abbas *et al.* (2013) in this respect that they performed an experiment of salinity stress against wheat, the result shows that Salinity resulted in a significant reduction of the grain protein, fat and fiber contents. Similarly in case of Ta-Habib variety the lower concentration 41g showed less 11.4% protein content, while maximum increased protein content showed by the 58g higher concentration 14%, but control was at 8.75%. In case of Sahar variety the lower concentration 41g showed 7.88% protein content while maximum increased value showed by the 58g higher concentration i.e. 10.5%, whereas control showed 7% protein content. In case of Siran variety the lower concentration 41g showed 7.88% protein content while maximum increased value showed by the 58g higher concentration i.e. 15.8%, whereas control showed 7% Protein content. The result is in contrast to those of [10] in that respect that they performed an experiment of salinity stress against wheat. Their result showed that sugar, proline content increased with increasing salinity level where as protein



content decreased in the physiologically active leaves of different treatments for all the varieties of wheat. In case of Janbaz variety the lower concentration 41g showed 7.88% protein content while maximum increase in protein showed by the 58g higher concentration i.e. 12.3%, whereas control showed 7%. The result is in agreement to those of [11] in that respect that they performed an experiment of salinity stress against *Lycopersicon esculentum* Mill. Their result showed that Increasing of salinity resulted in increasing of soluble proteins in stem and leaf.

### Carbohydrate contents

Like protein carbohydrate content was increased with increase in the NaCl concentration. Carbohydrate contents were increased with the increase in the NaCl concentration. Maximum increased value showed by the 58g higher concentration i.e. 63%, while minimum carbohydrate contents 56% were showed by the 41g lower concentration in the galaxy 2013, whereas control showed 52% carbohydrate content. The result is in covenant to those of [12] in this respect that they performed an experiment for effects of salt stress on the ionic concentration of *4Hordeum vulgare*. The result showed that NaCl treatments increased the concentrations of soluble carbohydrate in the elongating tissues of the growing leaf. Similarly in case of Ta-Habib variety the lower concentration 41g showed 55% carbohydrate content, whereas maximum increased carbohydrate content showed by the 58g higher concentration i.e. 62%, while control was at 55%. In case of Sahar variety the lower concentration 41g showed 57.8% carbohydrate content whereas maximum increased value showed by the 58g higher concentration i.e. 59.4%, though control showed 54% Carbohydrate content. In case of Siran variety the lower concentration 41g showed 54% carbohydrate content whereas maximum

increased value showed by the 58g higher concentration i.e. 63%, while control showed 53% carbohydrate content. In case of Janbaz variety the lower concentration 41g showed 58.5% carbohydrate content whereas maximum increased showed by the 58g higher concentration i.e. 61.9%, while control showed 52.7% carbohydrate content. The result is in covenant to those of [13-15] in this respect that they performed an experiment for effects of salt stress on growth of *Prosopis alba* their result showed that total soluble carbohydrates increased with increase in salinity.

### Conclusion

On the base of percentage difference between control and 58g higher concentration I came to conclude that Sahar and Siran Varieties are less effected by salt stress in 4 out of 6 (Biochemical) constituent even at 58g (higher concentration ) they were less effected as compared to the Ta-Habib , galaxy 2013 and Janbaz.

### Authors' contributions

Conceived and designed the experiments: U Ali & S Ali, Performed the Experiments: U Ali & K Ali, Analyzed the Data: MS Khan & M Shuaib, Contributed reagents/ materials/ analysis tools: Muhammad W Khan & S Ali, Wrote the paper: S Ali & U Ali.

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