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Use of Potash to Improve Sugar Cane Quality Under Various Water Stress Levels.

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Abstract

Water shortage in Pakistan is estimated more in future due to climate change which would ultimately leave egregious impact on sugar cane crop in the form of decrease in the yield. A randomized complete block design was used in this experiment with three replications in order to ascertain the impact of various levels of potash on sugar Cane crop to tackle the water scarcity in the area of BahaudIn Zakarya University Multan. The number of irrigations were selected as 10, 12 and 14.Potash was applied through soil (33%), foliar (33%) and ferttigation (33%). Study shows that water shortage has very important effect on all the observation . Ideal irrigation increase no of tiller ,stem girth ,no of mill able cane ,brix% and sugar recovery % as well as production of sugar cane in the experiment . Application of potash at different levels increase the recovery approximately 0.2 -0.3%. However, applying more potash effect on all parameter of sugar cane in this observation. Increase tiller, stem girth , ,brix% and sugar recovery % as well as production of sugar cane in the experiment approximately 85% over water shortage as compared to the ideal irrigation .So that it is discover that allocate sugar cane incorporation between potash and irrigation approach can be endorse to espouse and decrease the fatalistic effect on water shortage and sugar cane yield and acquire inexpensive sugar cane production as well as recovery of sugar cane .

Keywords: sugar cane normal Irrigation, water stress, potash application

Introduction

Prolonged droughts are one of the many negative consequences of climate change, and recently a big problem in the twenty-first century. According to projections, greater droughts and problems with water scarcity would plague several countries in the upcoming years (Spinoni et al., 2021). Water stress (WS) causes severe damage to agriculture, urban landscape, rangelands, and forests every yea. Plant growth is inhibited by water stress, which also has negative effects on crop physiology, morphology, and yield (Bayat and Moghadam, 2019). Water deficiency affects the morphological characteristics and important physiological and biochemical processes of plant. Sugarcane is an annual crop of the tropics, as it goes during four definite phases of growth, namely germination, tillering, grand growth, and maturity (Van Dillewijn, 1952; Abdelrady et al., 2023)

Sugar cane is annual crop which contain more sugar content in the stem (wijatanti 2008). High sugar content in the cane and create complex sucrose. Continuously sowing of sugar cane crop at the same area deficiency of fertilizer occurred decrease recovery as well as production of sugar cane(ramadan etal 2014). Potash is a chief elements for development of sugar cane (soemarnno 2012),potash function is to inducement for the growth of sugar cane crop. Main function of potash is to activate the enzyme and create starch in the sugar cane crop (sjofyan and kingston 2014). 25 monds of sugar cane crop deficient of elements occurred in that

areas about 1.95 kg N;0.30-0.82 KG P;205 and 1.17_kg; k2O (hunsigi 2011) . Therefore NPK should remain in the land after harvesting the crop for next crop . Thus for achieving 100 ton yield of sugar cane crop need 200 kg N; 85 kg p2O5 and 420 kg k2O per ha .So suitable amounts of fertilizer to maintain soil fertility (kumar etal 2007). Potash is a major elements for growth of sugar cane crop and rate of potash is very important for sugar cane crop (T F Kadarwat 2020).

Major problem is to get better growth and production of sugar cane crop is less available water (Souza et al., 2004). Water shortage occur where less rain fall and normally in semi arid region. (Deng et al., 2004). Potash application to the crop for retaliation of water stress Cakmak (2005), study shows that k increase the drought resistance by maintaining water balance . Plant can efficiently use fertilizer by foliar application enhance the crop production (Arifet al., 2006). Contradiction effect of water shortage can be controlled by foliar application of potash to all parts of plants to increased production of each plant (Pettigrew, 2008). K have a great contribution in osmoregulation, photosynthesis, transpiration, stomata opening and closing and synthesis of protein etc. (Cakmak, 2005;).

Different adaptive process in the crop are create in water shortage situation to retain over unsuitable condition. As in IPIOUAT-IPNI Intern Symposium (2009) fertilizer application of crop is main effect on water shortage .potash has a great role to create resistance in the crop. Potash maintain physiological processes like photosynthesis, translocation of cations into sink organs, regulation of turgor pressure and enzymes activation (Mengel and Kirkby, 2001) . Cakmak (2005) study that crop is disturb under water shortage condition need sufficient amount of potash in the plants. During drought situation ROS condition was create and oxidative finished to cell found need of potash is more in this condition (Foyer et al., 2002). Requirement of potash is increased by the crop under water shortage condition observe that potash is need for photosynthesis and carbon dioxide fixation , reason is that water shortage become source of closing stomata and reduced carbon dioxides fixation (Jiang and Zhang 2002)

To enhance exhaustive (sugar cane) crop from previous 10 years farmer face problem of lowering down water table and shortage of water occurs for crop growth (Bhatt et al 2021). Sugar cane not used in food and raw material to generate electricity ,bio ethanol. shortage of water on the sugar cane yield. Enhance sugar cane development in the water shortage to get more yield . Sugar cane production is deliberate by the application of better water use efficiency (Bhatt et al 2020). Sugar cane include many operation to maintain crop growth as well as climate fluctuation (nishima et al 2013). Drought condition direct effect on the stomata inception, less photosynthesis as well as carbon dioxide quality (osakabe 2012). Drought include many molecular process and create great response of moving of genetic material (vahisalu etal 2008). Interest must be creating among the grower to decrease water use efficiency and increase crop quality as well as yield. Sugar cane have a vital role in the food with more sugar and is extremely economically e.g recourse of ethanol and petrol (priyal et al 2015). Balance fertilizer is very important in sugar cane to increase production and quality as well as to save from eradication (bhatt et al 2021).

It is approximate that 100 tons sugar cane need the fertilizer (i.e., those taken up by 100 tons of cane) are: nitrogen (N) 208 kg ha−1, phosphorus (P) 53 kg ha−1, potassium (K) 280 kg ha−1, sulphur (S) 30 kg ha−1, iron (Fe) 3.4 kg ha−1, manganese (Mn) 1.2 kg ha−1, and copper (Cu) 0.6 kg ha−1 [shukla etal 2009]. While sugarcane need more amount of K (above those of N and P), in practice, little K is applied, even in K-deficient soils [bhatt and shrma 2011].

K is very important fertilizer which enhance crop nutrition and metabolism, N and water utilization , root growth which maintain leave stomata normally over water shortage position (wang etal 2013).

Further potassium help to work on crop enzyme work as catalyst energizing source (hawkesford etal 2012). Potassium act as growth, to convey the photosynthesis from leaves to plants (berg et al 2009). Potash keep stability of ion possessing positive charge and

having natural ability to move towards negative ions in the crop protein making ,photosynthesis, power conduct (kwong 2002), and drought to hostility (osakake etal 2013), potash associate with crop fertilizer like nitrogen to increase make use of regulation and decrease generally sowing valuation of sugar cane crop sowing (kwong 2015).
K also interacts with other plant nutrients such as N to enhance their use efficiencies and reduce overall cultivation costs of sugarcane cultivation [kwong 2015].
However price of chemical nutrients raise day by day, it is necessary to amend the application of nutrients to get maximum profit. It is useful application to face such a problem of both irrigation as well as nutrients given at a same time and certainly all elements are applied equally to crop for improvement of crop production and cane get more sugar .[howel etal 1980]
This technique gave opportunities to farmer given nutrients to crop in small amount without any disturbance to soil by mechanical operation. Irrigation method (both water and nutrients) in innovation of agriculture gave new opportunities to sustain water and fertilizer according to their wish in the land. Irrigation is very important new method in agronomic operation such as flow , channel , foliar (Beth and Filters 1981).

Materials and Methods

In order to evaluate the impact of potash in water stress condition of sugarcane. potash applied at different method and, experiment was developed at the Agriculture research institute Bhaudin University Multan during autumn 2020-2022 in (CRBD) (with three replicates) having plot size of 3 m × 8.5 m (25.5 m^2). For applying potash in three plot apply potash in split doses and 33% soil and 33% foliar 33% ferttigation application of potash apply in different k Levels in different time. The number of irrigation were 10, 12,14 .The germination was started in a week's time or even earlier and after 40-50 days, foliar application of potash is applied on the crop the maximum tiller are emerge out and fertigation is done after 120 days when sets are emerging is the best time to apply potash in the statistically designed experimental plots. The treatment details are as under

Results and Discussion

Impact of drought condition on sugar cane little water use for irrigation saving 30 % irrigation for fulfill need of sugar cane crop, recorded the values of no of tiller, stem girth inches ,brix, , as well as cane sugar cane yields as shown in Table .
In treatment T1 maximum and minimum tiller were noted in the experiment T1 2.38 tillers per plant were seen while in T3 no of tillers 5.6 were noted as shown in table . (Humbert 1968),).reported that mill able cane effect of water stress condition on sprouting , germination, development, normally effect on the tiller as well as at time of cutting stage as shown in fig .
Therefore in stem girth inches T1 maximum and minimum were observed in the experiment minimum stem girth inches were seen in T1 2.1 and maximum in T3 stem girth 3.6 inches was noted (Van Dillewijn (1952), As stem girth found that water is essential for photosynthesis process, more the stalk cells swollen the leaves cell so explained as shown in table . (Ramesh and Mahadevaswam y, 2000), Anyhow water shortage may impact on the stem length to the ripening stage. El-Geddawy et al., (2015), Fahmy et al., (2017), Hemeid et al., (2017), Abu-Ellail et al., (2019), Kadarwati, (2020), Taha et al., (2020), Abd-Elazez (2021) and Sasy and Abu-Ellail, (2021) reported that as increase potassium amount to enhance the stem girth , young cane , increase production of sugar cane as well as increase quality that is main parts of sugar production. El-Shafai (1996), Bekheet (2006), describe that enhance sugar cane production cognate with shoot size , stem girth and young cane these observation are origin as shown in fig
In brix maximum and minimum was observe in the experiment T1 minimum brix 12.8 was noted and in the T3 maximum brix 16.3 was seen (Taha et al., 2020; Abd-Elazez, 2021; Sasy

and Abu-Ellail, 2021), say that enhance K quantity has a strong effect on the movement in the energy relationship in the crop. Gadallah and Mehareb 2020), observe that cane recovery also contrived by water shortage condition. Geddawy et al., 2015; Fahmy et al., 2017; Hemeid et al., 2017; Abu-Ellail et al., 2019; Kadarwati, 2020; Taha et al., 2020; Abd-Elazez, 2021; Sasy and Abu-Ellail, 2021), they concluded that two parts of sugar production cane production and quality percentage as well as enhance production . Ramification of K quantity on sugar cane crop has a great responsibility to enhance height, stem girth and young cane. K has a great role in the growth and enlargement of biological structure of the crop. Therefore in movement action the maturing of crop at the harvesting time effect on the quantity of mill able cane as shown in table. El-Geddawy et al., (2015), Fahmy et al., (2017), Hemeid et al., (2017), Abu-Ellail et al., (2019), Kadarwati, (2020), Taha et al., (2020), Abd-Elazez (2021) and Sasy and Abu-Ellail, (2021), As increase potassium amount enhance the , stem girth , young cane , increase production of sugar cane as well as increase quality that is main parts of sugar cane production as shown in fig .

In the T1 37.66 yield t/ha were noted so in T3 44.77 t/ha yield was observe as shown in table. (Rahman et al., 2008), say that light irrigation is best for growing young plant about 16 weak of sugar cane. El-Shafai (1996), Bekheet (2006), Explain that enhance sugar cane production cognate with shoot size , stem girth and young cane these observation are origin . Geddawy et al., 2015; Fahmy et al., 2017; Hemeid et al., 2017; Abu-Ellail et al., 2019; Kadarwati, 2020; Taha et al., 2020; Abd-Elazez, 2021; Sasy and Abu-Ellail, 2021), study that two parts of sugar cane production and quality percentage as well as enhance the production . Ramification of K quantity on sugar cane crop has a great responsibility to enhance height, stem girth and young cane. K has a great role in the growth and enlargement of biological structure of the crop. Therefore in movement action the maturing of crop at harvesting time effect on the quantity of mill able cane .

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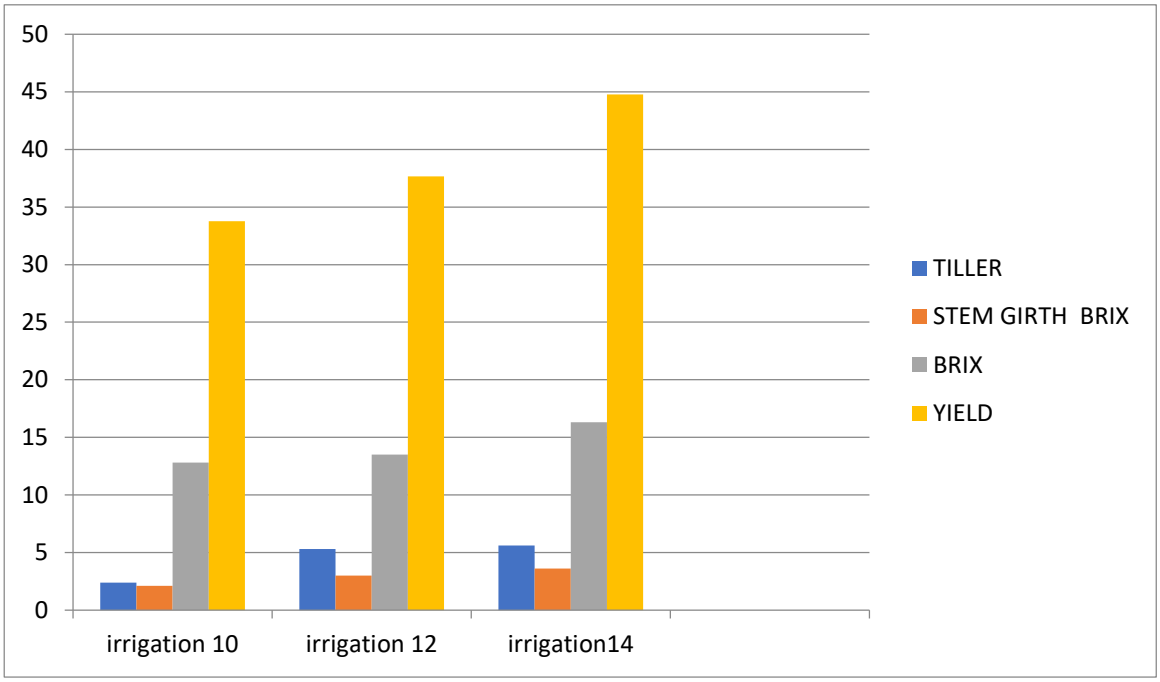
Table 1 : USE OF POTASH TO IMPROVE SUGAR CANE QUALITY UNDER VARIOUS WATER STRESS LEVEL

Treatments	Tiller	Stem girth	Brix	Yield t/
Irrigation 10	Grand mean 2.38 Cv 41.47	Grand mean 2.1 Cv 4.55	Grand mean 12.8 Cv 3.3	Grand mean 37.66 Cv 19.95
Irrigation 12	Grand mean 5.30 Cv	Grand mean3.00 Cv 5.99	Grand mean 13.5 Cv 3.54	Grand mean 33.77 Cv 6.34
Irrigation 14	Grand mean 5.30 Cv35.99	Grand mean 3.6 Cv 9.19	Grand mean 16.3 Cv 16.51	Grand mean 44.77 Cv 2.110

FIG 1: **USE OF POTASH TO IMPROVE SUGAR CANE QUALITY UNDER VARIOUS WATER STRESS LEVEL**



Conclusion

Impact of potash on water shortage condition is very helpful to save water. Applying potash in split dozes ,basal ,foliar and , ferttigation respectively. To decrease the whole plant growth, recovery, the observation revealed that water shortage had a appreciable or eminently glaringly effect on sugar cane impute in this research. Aloud, little water materially effect on chemical possession as well as physical features, effect on concentration of potash and water. To decrease the impact of water stress potash given to the crop in different level soil fertigation as well as foliar . The discovery intimate that treatment of potash with 14 irrigation had much greater effect on control treatment and water stress regime can be endorse to retrieve low cast sugar cane and production as well as high quality and prosecute to repository approximately 40% water . Therefore regale various levels of potash has a great effect on production as well as quality of sugar cane.

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