Preliminary Report

Konzept Green Pflanzen Booster application on various crops in a greenhouse trial conducted at Welgevallen Experimental Farm, University of Stellenbosch.

1. INTRODUCTION

The ability to grow any crop at any given time of the year without limitations and restrictions due to weather, soil and landform has been one of the most significant scientific milestones over recent years. It is widely acknowledged that the ability to precisely control nutrient application in hydroponics, compared to open field production, aids in better nutrient uptake and nutrient use efficiency by plants (Adams 1992).

This also correlates with climatic variables and has an impact on the yield and nutritional quality of the crop. Nutrients are primarily taken up by plant roots; yet several nutrients can also be absorbed through leaves when deposited on the leaf surface or with foliar sprays (Marschner, 2012). For instance, certain plants, like epiphytes such as *Bromelia tillandsia* have no or hardly any roots and obtain nutrients mainly through their leaves (Benzing et al., 1976), like aquatic plants. Moreover, foliar sprays are used when the soil or the plant conditions limit the availability of some nutrients. This is common practice for crops susceptible to Fe and Mn deficiency such as citrus in calcareous soils or crops grown in soil poor in delivering Zn (Marschner, 2012; Fernández et al., 2013).

Nevertheless, primary macronutrients, like N, P, and K can be absorbed through foliage as well. These nutrients can enter the plant within hours which could make foliar sprays a means for quick corrections for soil applied nutrients in case of any limitation in supply or uptake, or crop specific situations like the rapid supply of urea after the harvest and before leaf senescence in apple (Dong et al., 2005).

2. AIM(S)

The aim of this study is to ascertain the effect of applying Konzept Green Pflanzen Booster as a foliar spray to commonly cultivated field and vegetable crops produced in Sub Sahara: The foliar spray will be investigated for its role as possible:

- Plant productivity enhancer
- As reducing water usage/irrigation

The study will include measuring the **quantitative** and **qualitative** parameters of these crops.

3. MATERIAL AND METHODS

A greenhouse experiment was conducted at the Stellenbosch University, Welgevallen Experimental Farm for the period April-June 2020 to study plant performance after using Konzept Pflanzen Booster

- Maize (*Zea mays L.)*
- Tomatoes (*Lycopersicon esculentum, cv.Moneymaker)*
- Spinach (Spinachea *oleracea, cv. Ford Hook Giant)*
- Beans (*Phaseolus vulgaris L, cv. Contender)*
- Canola (Brassica napus spp.cv. Hyola 559 TT)
- Wheat (*Triticum aestivum, cv. SST 085*)

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3.1 GENERAL DESCRIPTION

3.1.1 Experimental site

The experiment was conducted in Glasshouse 3 at the Department of Agronomy, Welgevallen Experimental Farm, University of Stellenbosch, Stellenbosch which is located at: 33°56'33"S 18°51'56"E. Elevation above sea level: 122 m = 400 ft.

3.1.2 Soil characteristics

The experiment was laid out in 10L plant bags with coco peat as growth medium total of 124 10L black potting bags were used in this experiment with 24 bags for each treatment, thus 4 bags / crop. The potting bags were perforated 5 mm from the bottom to allow excess water to drain. Bags were placed a meter above ground on dripping trays.

The bags were filled in with an inert pre-treated coir substrate that had been soaked to allow it to expand and to have better water holding capacity (WHC). Transplanting was done directly from seedling tray to potting bag and after irrigation with water, treatments were placed as per layout and design (Fig 1)

3.1.3 Climatic conditions

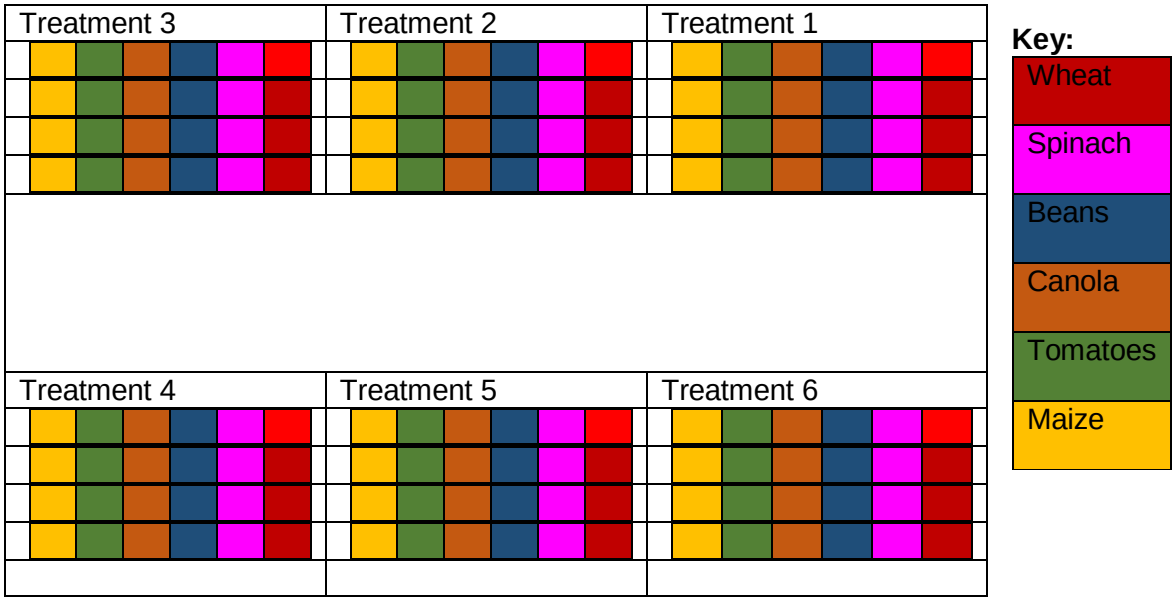
Optimization of all plant growth and development variables has been achieved through sustainable and economic practices using the hydroponic system with benefits beyond increased biomass (Benton Jones Jr.2004), the type and properties of the growth medium, which is a soilless medium, fertigation management and the regulation of temperature, humidity and light intensity, thus the environment of the glass house was optimal relative humidity (RH) range of 60% to 90% to ensure that nutrients can be adsorbed and effective foliar application achieved.

Temperature was also set for a proper leaf uptake, a day and night temperature of 25^{o}C and 15^{o}C respectively.

The light level was moderate to prevent leaf scorching by the salts sprayed on the leaf as well as to allow the plant time to take in the nutrients. Moderate light levels are beneficial as they create xylem and phloem transport.

3.2.1 Design and layout

The experiment consisted of 6 treatments was laid out in non- randomized block design with four replications. (Fig. 1).



3.2.2 Treatment details

- Treatment 1: Control, only water, no Konzept Green, thus foliar spray of 1L water on to 4 plant replicates
- Treatment 2: Konzept Green at a dose of 0.5x application of solution, thus foliar spray of 1g/L water solution onto 4 plant replicates
- Treatment 3: Konzept Green at a dose of 1x application of solution, thus foliar spray 2g/L water solution onto 4 plant replicates
- Treatment 4: Konzept Green at a dose of 2x application of solution, thus foliar spray of 4g/L water solution onto 4 plant replicates
- Treatment 5: Only nutrition fertigation directly applied to plant roots, thus 1L nutrient solution onto 4 plant replicates
- Treatment 6: Konzept Green at a dose of 1 x application of solution, thus foliar spray of 2g/500ml water solution to 4 plant replicates (50% reduced water application)

All treatments were applied manually.

3.2.3 Application regime and observations

4 applications of abovementioned treatments were conducted during the crop's growth period. The application dates coincided with the plant measurements which was done prior to application.

1st application one week after transplant for emergence, 2nd application two weeks later and third application 2 weeks after 2nd application. Fourth application two weeks later after third application.

Table 1 Product application schedule and records

	Application 1	**Application 2**	**Application 3**	**Application 4**
Date	24/04/2020	8/05/2020	22/05/2020	5/06/2020
No of days after application	14	14	14	14
Time	08h30	09h00	09h00	09h00
Air temp (C)	25	25	25	25
RH (%)	50%	50%	50%	50%
Cloud cover (%)	10	10	30	60*

3.2.4 Chemical composition of foliar spray Organic Konzept Green:

Calcite mineral extract powder, prepared as per treatment details 3.2.2

Fertigation solution was made up in a 1500l tank EC of 1.40 mS cm^{-1}

Table 2 Fertilizer concentration used: Fertilizer source (g)

Solution	(45% Ca)
KNO3	252.5
K2SO4	174
KH2PO4	136
NH4NO3	56
CaNO3	580
MgNO3	128
MgSO4	—
CaSO4	—
Hidrospoor 30 (micronutrients)**	

** Standard application 20 g/1000 l.

Plant productivity is closely related to the uptake of each nutrient; thus, an important feature of nutrient solutions is that they must contain the ions in solution and in chemical forms that can easily be absorbed by plants (Marschner 2012)

Table 3 Cation and anion percentages in the nutrient solution used to fertigate Treatment 5 with the 6 crop types during their growth cycle. The EC of all the solutions was 1.40 mS cm^{-1}

	Cations				**Anions**	
Nutrient solution	$Ca^{2}+$	K+	$Mg^{2}+$	NO_3-	$H^{2}PO_4$-	SO_4^{2}-
Solution 1 (S1)	45	35	20	60	5	35

3.2.5 Visual phytotoxicity assessment

Test was conducted 24hrs after each application of Konzept Green to the crops as outlined in materials and methods. All plants were evaluated for phytotoxicity presence using and stating symptoms scored e.g. leaf scorching, leaf discoloration, abnormal leaf, or fruit growth.

Table 4 Phytotoxicity data collection

PHYTOTOXICITY LEVELS						
	T1	**T2**	**T3**	**T4**	**T5**	**T6**
DATE & CROP	Plant 1 -4	Plant 1-4	Plant 1-4	Plant 1-4	Plant 1-4	Plant 1-4
25/04/2020 Wheat	0%	0%	0%	0%	0%	0%
25/04/2020 Spinach	0%	0%	0%	0%	0%	0%
25/04/2020 Beans	0%	0%	0%	0%	0%	0%
25/04/2020 Tomatoes	0%	0%	0%	0%	0%	0%
25/04/2020 Canola	0%	0%	0%	0%	0%	0%
25/04/2020 Maize	0%	0%	0%	0%	0%	0%

The Konzept Green Booster demonstrated excellent crop selectivity with no crop and/or leaf injury 24 hours after application since commencement date 24/04/2020, until finishing date 19/06/2020.

4. MEASUREMENTS AND ANALYSIS

Seedlings were considered viable with the emergence of the third leaf. Plant growth and development was constantly monitored on a visual basis and climatic variables measured and recorded as per Table 1.

The chlorophyll content was measured by obtaining 3 leaves per sample, collected from different sections on the plant. A section of that leaf was placed under the chlorophyll meter to obtain the chlorophyll content index. The sum of all three readings per plant were then averaged to give the final plant chlorophyll content index, where cci is chlorophyll content and n is number of leaf samples (Rodriguez and Miller 2000).

Average chlorophyll content, (AVE CCI) =$cci1+cci2+cci^3$ n

Plant height was measured using a tape measure as the distance (mm) from the top of the growth medium to the top of the plant canopy or height above ground (Heady 1957).

Fresh weight (g) was measured upon harvest and dry weights (g) after oven drying for 3 days (Stefanelli et al. 2011). At the final harvest, 56 days after planting, the samples were stripped of the outer leaves and roots removed for fresh weight measurements. Dry weights were recorded after oven drying for 3 days at 60^{o}C. **To assess the nutritional content, samples were dried, milled and sent to Department of Agriculture Animal Husbandry Laboratory for full chemical analysis of all the macro and micro elements.**

Leaf fertilization is never used to replace soil fertilization for macro elements completely (Collas, 2005). Micro elements are routinely administered via foliar application (Collas, 2005). It is more cost effective to apply macro nutrient fertilizers by broadcasting solid fertilizers on the soil or even to use fertigation lines rather than foliar sprays.

Correcting micronutrient deficiencies through foliar application is an effective method due to easy absorption through leaves results in getting profitable yield (Asad et al., 2003; Parveen and Rehman, 2000). Advantages of foliar application of Zn, Mn, Cu, Fe and B over soil application have also been reported by Rimar et al. (1996) which include high effectiveness, rapid plant responses, convenience and elimination toxicity symptoms brought about by excessive soil accumulation of such nutrients.

The leaf area index (LAI), the leaf orientation value (LOV), and the extinction coefficient (k) are important structural parameters of crop populations. By affecting light distribution, they directly affect crop photosynthetic efficiency, and ultimately show an impact on crop biological yield and its distribution in various plant organs. Phytotoxicity is defined as a delay of seed germination, inhibition of plant growth or any adverse effect on plants

Leaf chlorophyll was measured by using SPAD-502 chlorophyll-meter. SPAD readings are correlated with the amount of chlorophyll present in the leaf (Markwell et al., 1995).

5. RESULTS AND DISCUSSIONS

Foliar application of nutrients is an important crop management strategy in maximizing crop yields. It can supplement soil fertilization when nutrients are applied to soils, they absorbed by plant roots and translocated to aerial parts. In case of foliar application, the nutrients penetrate the cuticle of the leaf or the stomata and then enter the cells. Foliar fertilization in combination with soil fertilization in food crops will increase yield, though foliar spray may increase protein content of grains, if applied during anthesis or flowering. The yield response of field crops to foliar fertilization of macro and micronutrients is highly variable.

5.1 Effect of Foliar Application of Konzept Green on tomato plant growth.

Tomato (Lycopersicon esculentum Mill.) is important crop in many countries. According to FAO, tomato has a main role in human nutrition because of its rich source of lycopene, minerals, and vitamins such as ascorbic acid and b-carotene which are antioxidants and promote good nutrition.

Foliar application of the nutrients is obviously an ideal way of evading the problems of nutrient availability. Roma cultivar seeds were sown on 5 April 2020 in seedling trays and transplanted into coir/cocopeat growth medium, at a plant density of 3 plants per plant bag. Plants were grown vertically, allowing the principal stem to grow. Spraying solution of Konzept Green were prepared with distilled water and sprayed four times during plant growth by 14 days between treatments with a sprayer. Temperature inside the greenhouse was controlled using automatic activation of the aerial heating fan with a TCL split type air condition-indoor unit system to maintain temperature between 25 °C and 16°C (day and night).

The trial ended after 56 days from transplantation where all the plant replicates of the different treatments were destructed to measure and record data of plant height, wet biomass, phytotoxicity, water/nutrition over the trial period, root weights, flowers / cluster, fruits / plant, yield, fruit weight, chlorophyll content and LAI (Leaf area index).

Based on data submitted, Fig 2 and Fig 3 outline the highest average plant growth recorded was for T2 over the trial period, whilst the relative average growth of T4 reflected the best growth vigour of the respective treatments.

In Fig 4 & Fig 5, no significant chlorophyll content differences noted, though T2 displayed evidence of a higher leaf chlorophyll at the end of the trial.

In Table 6, T6 demonstrated the highest average plant biomass weight, though the plants received 50% of the recommended water application. Biomass can be an indicator of vigorous vegetative growth. Future foliar spray trials on tomatoes will evidently demonstrate the full potential of the plants till physiological maturity. In Table 5, T4 as a foliar spray averaged well against T5 (root -fed nutrition) on the potential yield parameter of the plant which also corresponds with the highest root weight in Table 7,

Fig 2 Average plant heights

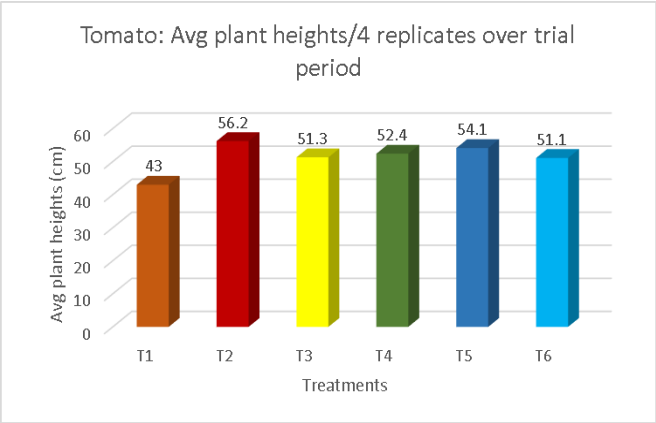


Fig 3 Average plant growth vigour

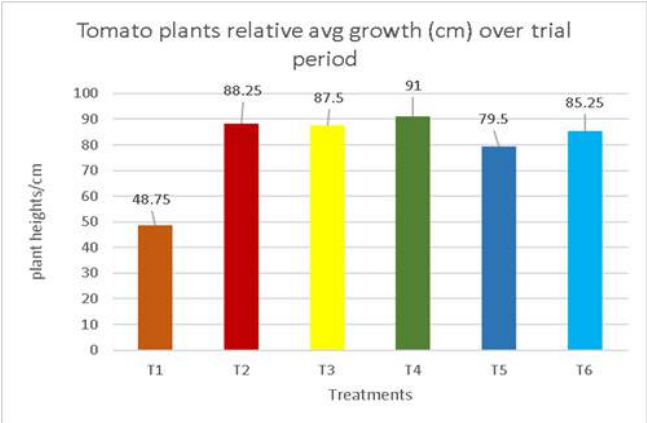


Fig 4 Tomato Chlorophyll reading at 2nd foliar spray

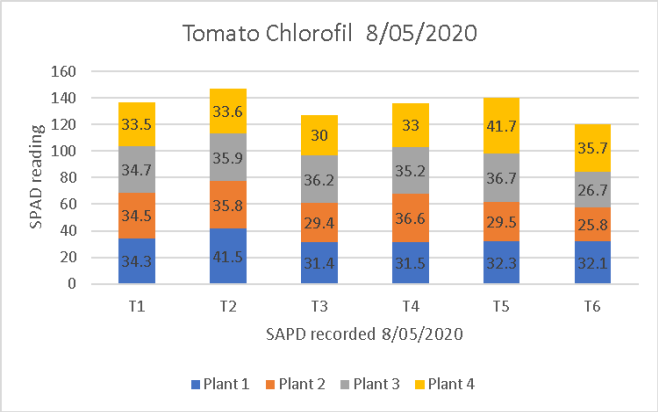


Fig 5 Tomato Chlorophyll reading at end of trial

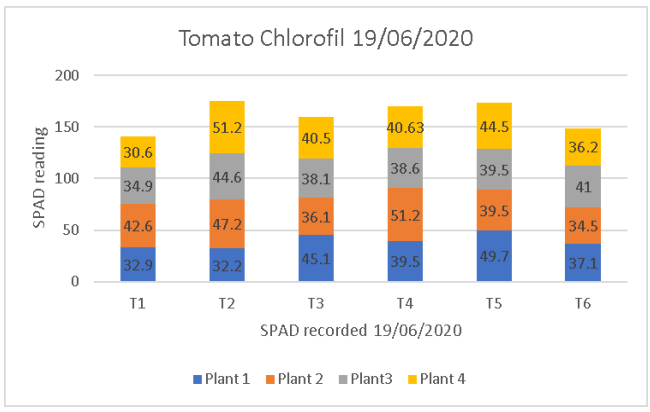


Table 5 Average yield potential of tomato plant at end of trial period (56 days)

Treatment	Tomato fruit count	Tomato fruit set	Tomato flowers	Avg potential yield/plant
T1	2	64	7	73
T2	17	75	29	121
T3	16	21	20	57
T4	20	78	30	128
T5	24	86	27	137
T6	20	77	22	119

Table 6 Tomato Average wet Biomass

	Tomatoes Wet Biomass				Avg wet
	Plant 1	Plant 2	Plant 3	Plant 4	Biomass
T1	46.4	320.2	321.17	313.4	250.3
T2	239.1	263.6	215.02	233.93	237.9
T3	323.56	96.3	43.82	110.09	143.4
T4	271.66	308.78	286.18	377.51	311.0
T5	320.2	226.73	375.51	387.15	327.4
T6	263.6	402.9	323.2	377.03	341.7

Table 7 Total root weights (g)

	Tomatoes root weights				
	Plant 1	Plant 2	Plant 3	Plant 4	total
T1	2.47	9.96	5.8	20.52	38.75
T2	10	10.4	15.3	12.74	48.44
T3	13.3	1.5	6.1	14.43	35.33
T4	17.2	38.16	18.5	15.1	88.96
T5	9.96	12.7	32.15	31.72	86.53
T6	10.4	35.65	17.6	12.52	76.17

5.2 Effect of Foliar Application of Konzept Green on canola growth.

The study was carried out to evaluate the effects of foliar application of Konzept Green on vegetative and reproductive growth, yield, and quality of canola plants. Data were recorded for plant height, wet biomass, phytotoxicity, water/nutrition over the trial period, shoot counts, chlorophyll content and LAI (Leaf area index). Based on the data submitted:

The data of the plant heights in Fig 6 indicates that T4 portrayed excellent growth at each of the treatment dates as outlined. Konzept Green treatments i.e. T2, T3 & T4 recorded significant growth vigour over the trial period.

Initial Chlorophyll readings at 2nd spray indicated T2, T3 and T4 higher chlorophyll content than the controls T1 & T5. (Fig 8) At the end of the trial (Fig 9) an increase of chlorophyll content was recorded for Konzept Green foliar booster spray treatments in T2, T3, T4, T6. Significant biomass averages for T2, 376.2g were recorded over the trial period. In Table 10 and Table 11, Plant average leaf area indexes as well as shoot counts indicated that T4 performed the best of all the canola treatments.

At the end of the trial the control T1 (Table 12) was still in vegetative stage whilst the Konzept treatments are in the bud/flower stage.

Fig 6 Average plant heights

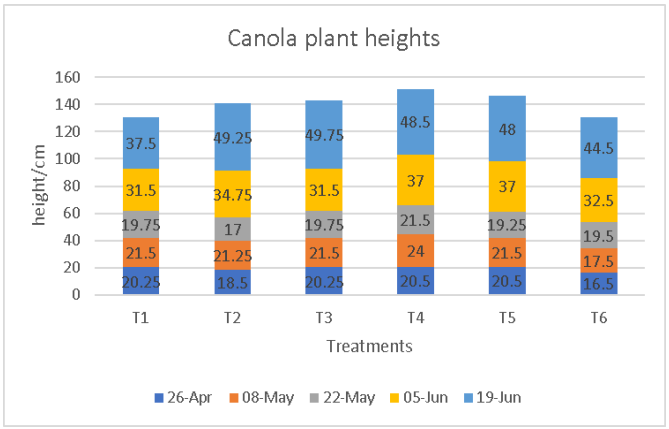


Fig 7 Average plant growth vigour

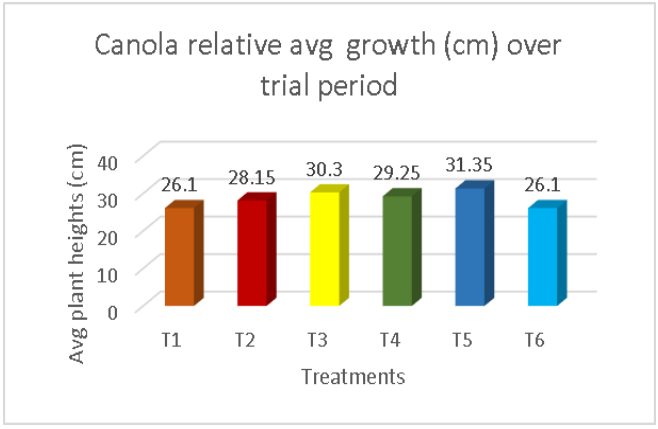


Fig 8 Canola Chlorophyll reading at 2nd foliar spray

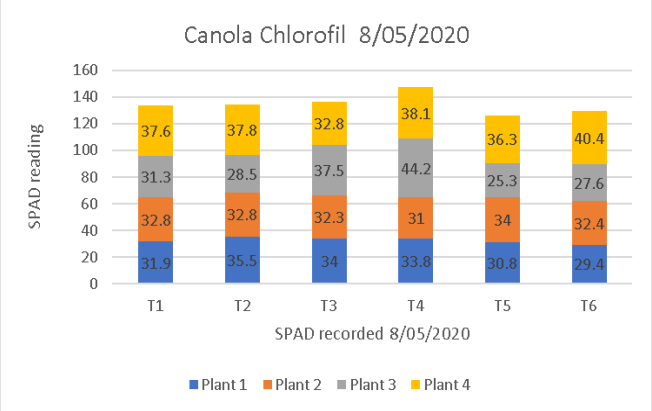


Fig 9 Canola Chlorophyll reading at end of trial

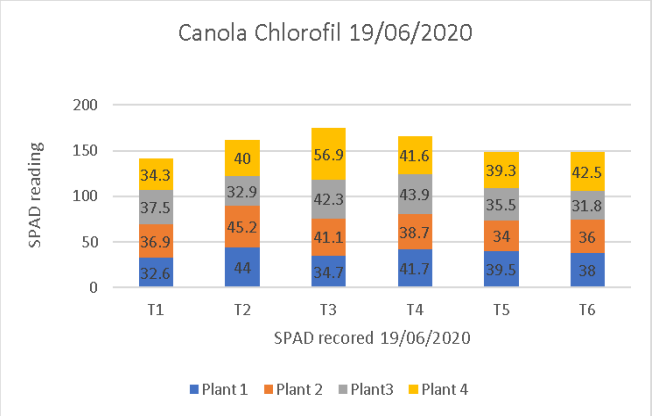


Table 9 Canola- average wet Biomass

		Canola wet BM			
Treatment	Plant 1	Plant 2	Plant 3	Plant 4	Avg
T1	38.24	69.71	200.6	191.17	124.9
T2	157.86	662.36	306.09	378.61	376.2
T3	151.03	212.87	318.49	418.31	275.2
T4	229.3	205.56	403.51	301.29	284.9
T5	216.62	234.66	301.38	476.46	307.3
T6	124.5	131.72	260.6	239.25	189.0

Table 10 Canola - average shoot counts

	Canola shoot counts				
	Plant 1	Plant 2	Plant 3	Plant 4	Avg
T1	6	12	4	8	8
T2	11	10	6	7	9
T3	9	8	6	8	8
T4	11	11	8	8	10
T5	10	9	5	7	8
T6	11	7	6	10	9

Table 11 Canola – Leaf Area Index

		Canola Leaf Area			
Treatment	Plant 1	Plant 2	Plant 3	Plant 4	Avg
T1	708.57	671.72	282.24	427.91	522.6
T2	1573.43	897.39	1644.58	2118.12	1558.4
T3	2179.39	1853.7	1897.75	2435.35	2091.5
T4	2351.82	2318.8	3045.28	1886.26	2400.5
T5	1859.81	2537.87	1366.66	2576.46	2085.2
T6	1247.61	1811.36	1563.89	1202.57	1456.4

Table 12 Plant physiological stage

	Canola plant physiological stage at end of trial			
	Plant 1	Plant 2	Plant 3	Plant 4
T1	veg	veg	bud/flower	veg
T2	bud	bud/flower	veg	bud/flower
T3	veg	bud/flower	bud/flower	veg
T4	flower/pod	bud/flower	bud/flower	veg
T5	flower/pod	bud/flower	veg	bud/flower
T6	veg	veg	veg	veg

5.3 Effect of Foliar Application of Konzept Green on spinach growth.

The study was carried out to evaluate the effects of foliar application of Konzept Green on vegetative and reproductive growth, yield, and quality of spinach plants. Data were recorded for plant height, wet biomass, phytotoxicity, water/nutrition over the trial period, root weights, chlorophyll content and LAI (Leaf area index).

Based on the data submitted: Significant growth in average plant heights recorded for T2, T4 and T6, whilst T4 showed excellent growth vigour over the growth period in Fig 11. Significant plant average leaf area indexes recorded for T4 (43.8) cm2 and T6 (41) cm2, respectively. Excellent average wet biomass was recorded in Table 14 for T2 (183g) which indicate a correlation between T2 plant heights and biomass.

Fig 10 Average plant heights

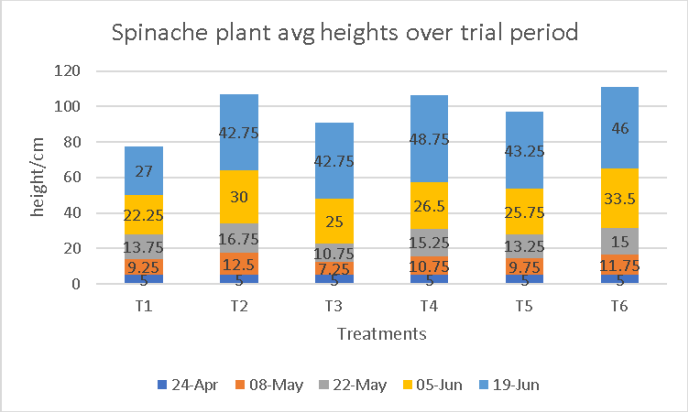


Fig 11 Average growth vigour

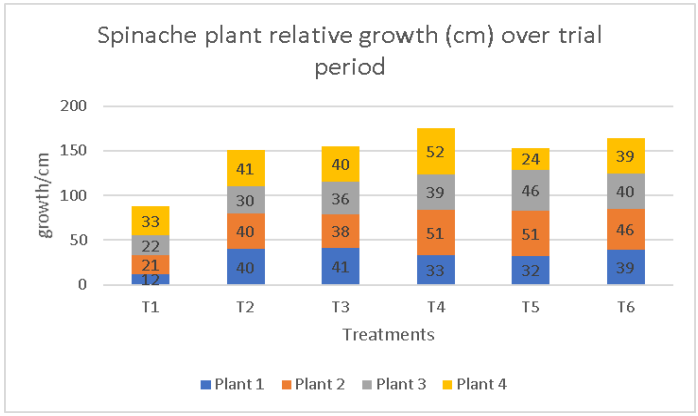


Table 13 Spinach leaf area index

	Spinache Leaf area Index/cm2				
Treatment	Plant 1	Plant 2	Plant 3	Plant 4	Avg
T1	12	21	22	33	22.0
T2	40	40	30	41	37.8
T3	41	38	36	40	38.8
T4	33	51	39	52	43.8
T5	32	51	46	24	38.3
T6	39	46	40	39	41.0

Table 14 Spinach Wet Leaf Biomass

	Spinache Wet Leaf BM				
Treatment	Plant 1	Plant 2	Plant 3	Plant 4	Avg
T1	18.83	45.9	34.12	38.4	34.3
T2	62.4	221	237.9	210.69	183.0
T3	166.6	124.6	97.67	153.09	135.5
T4	189.72	172.4	141.4	26.7	132.6
T5	86.6	129.5	242.9	226.15	171.3
T6	170.39	93.95	130.8	138.3	133.4

Table 15 Plant physiological stage at end of trial

	Physiological stage of plant at end of trial			
Treatment	Plant 1	Plant 2	Plant 3	Plant 4
T1	veg	veg	veg	veg
T2	veg	veg	veg	veg
T3	veg	veg	veg	veg
T4	veg	veg	veg	veg
T5	veg	veg	veg	veg
T6	veg	veg	veg	veg

5.4 Effect of Foliar Application of Konzept Green on bush bean growth.

The study was carried out to evaluate the effects of foliar application of Konzept Green on vegetative and reproductive growth, yield, and quality of bush bean plants. Data were recorded for plant height, wet biomass, phytotoxicity, water/nutrition over the trial period, root weights, flowers / cluster, fruits / plant, yield, fruit weight, chlorophyll content and LAI (Leaf area index). Based on the data submitted: The bush bean cv Contender is not a runner type of bean, thus the heights recorded are inherent to the variety. Fig 12 indicated that T3 and T4 had the best growth in height recorded over the trial period, though at the end of the trial no significant growth vigour observed as in Fig 13. Chlorophyll readings at 2nd spray Fig 14 and Fig 15 indicated higher SPAD readings for the foliar sprayed plants T2, T3 and T4 which could be ascribed to the foliar spray applications of Green Konzept Booster as the growth medium contain only inert matter, thus no nutrition. Table 16 Bean Leaf area index indicates significant plant average values for T3 (1487) and T4(1429) which would confirm the correlation between leaf area index and chlorophyll content. T3 also demonstrated the highest average wet biomass (52.3g) Table 17

Fig 12 Bean plant average heights

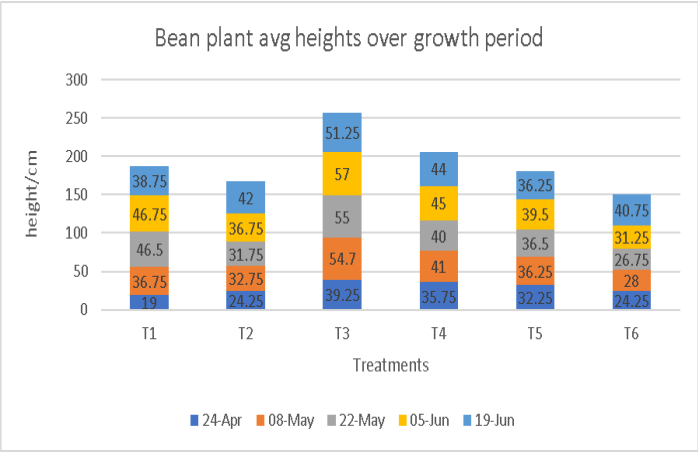


Fig 13 Bean growth vigour

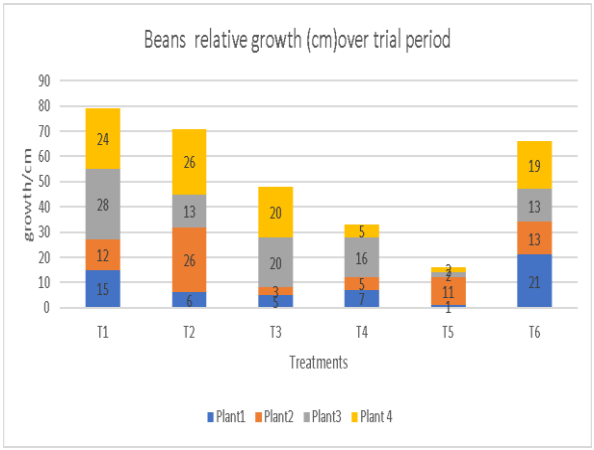


Fig 14 Bean leaf chlorophyll reading at 2nd spray

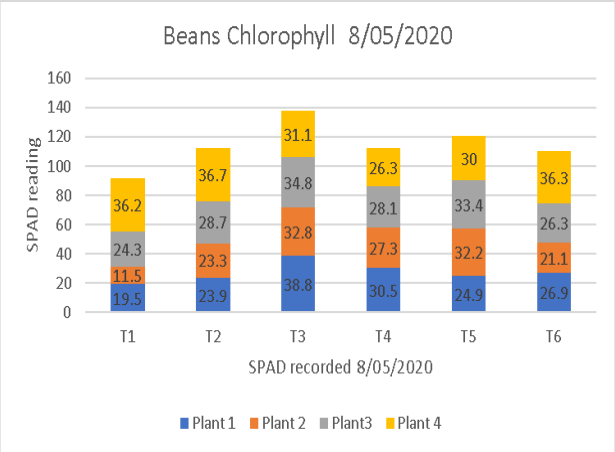


Fig 15 Chlorophyll reading at end of trial

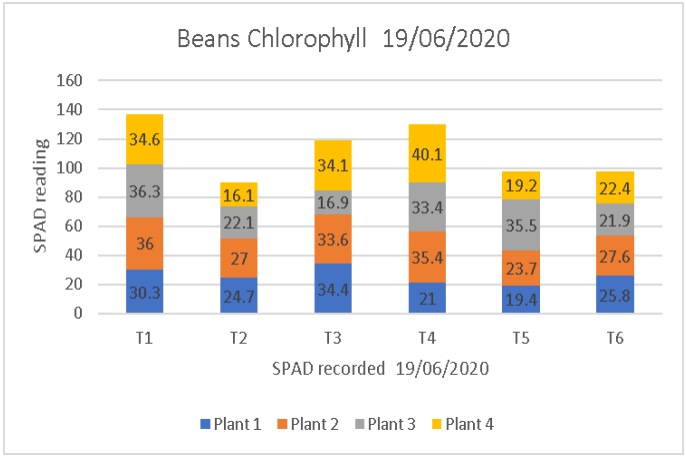


Table 16 Bean Leaf Area Index

	Beans Leaf area index/cm2				
Treatment	Plant1	Plant2	Plant3	Plant 4	Avg
T1	112.58	30.21	313.56	786.48	310.7
T2	755.68	626.28	742.33	367.57	623.0
T3	1381.98	1337.45	1956.65	1274.74	1487.7
T4	302.46	1266.58	3757.5	372.9	1424.9
T5	656.8	455.68	2482.82	1565.75	1290.3
T6	102.28	62.4	709.11	458.76	333.1

Table 17 Beans wet Biomass

		Beans plant wet Biomass (g)			
Treatment	Plant1	Plant2	Plant3	Plant 4	Avg
T1	7.84	21.1	50.23	32.8	28.0
T2	21.1	26.27	16.68	9.39	18.4
T3	50.23	45.47	52.87	60.69	52.3
T4	32.4	70.92	3.78	2.75	27.5
T5	27.82	36.22	55.96	64.82	46.2
T6	9.89	15.3	8.66	9.68	10.9

Table 18 Beans physiological stage at end of trial

Beans	Physiological stage of plant at end of trial			
Treatment	Plant1	Plant2	Plant3	Plant 4
T1	flower/pods	flower/pods	flower/pods	flower/pods
T2	bud/flower	bud/flower	bud/flower	bud/flower
T3	bud/flower	bud/flower	bud/flower	bud/flower
T4	bud/flower	bud/flower	bud/flower	bud/flower
T5	bud/flower	bud/flower	bud/flower	bud/flower
T6	flower/pods	flower/pods	flower/pods	flower/pods

5.5 Effect of Foliar Application of Konzept Green on Maize growth.

The study was carried out to evaluate the effects of foliar application of Konzept Green on vegetative and reproductive growth, yield, and quality of maize plants. Data were recorded for plant height, wet biomass, phytotoxicity, water/nutrition over the trial period, root weights, anthesis , cobs / plant, yield, , chlorophyll content and LAI (Leaf area index).

Based on the data submitted: No significant plant height difference between treatments recorded as demonstrated in Fig 16, though the maize plants showed exceptional vigour in T2, T3, T4 as foliar spray compared to T5 which is nutrition directly to the plant roots. Significant chlorophyll readings recorded for T2, T3, T4 and T6 with an increase of chlorophyll content towards the end of the trial as indicated in Fig 18 and Fig 19. Konzept Foliar sprayed treatments showed significant average biomass in T2, T3 and T4 (Table 20) and significant Leaf area indexes Table 21. Preliminary yield was determined when cobs were harvested at the end of the trial and silk leaf colours recorded which indicated that the plants were already in reproductive stage after 56 days.

Fig 16 Maize plants average heights over trial period

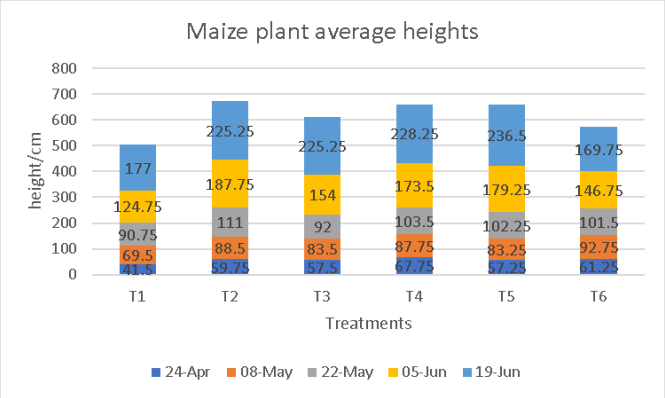


Fig 17 Maize plant growth vigour

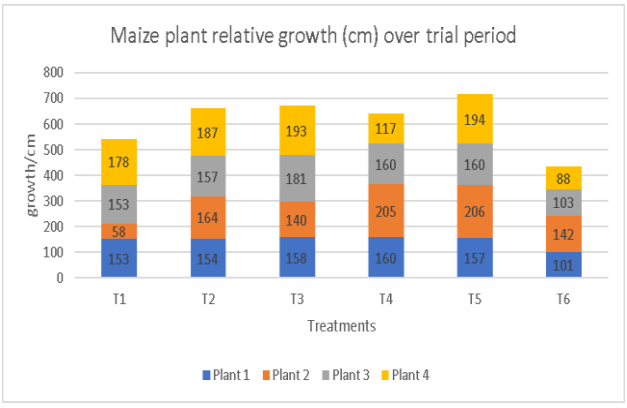


Fig 18 Chlorophyll readings at 2nd spray

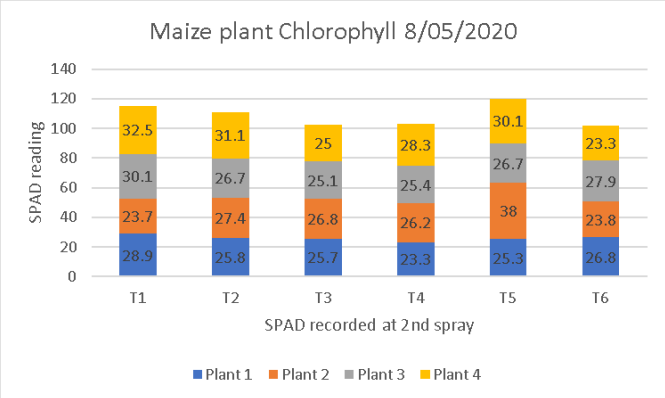


Fig 19 Chlorophyll reading at end of trial

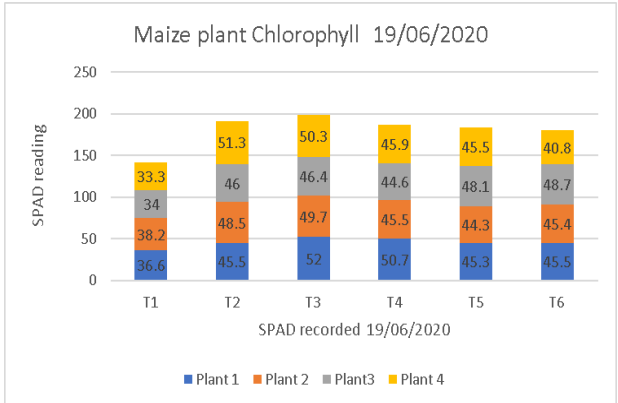


Table 20 Maize plant wet Biomass (g)

	Maize wet Biomass				
Treatment	Plant 1	Plant 2	Plant 3	Plant 4	Avg
T1	263.4	55.5	132.2	126.1	144.3
T2	362.3	402.9	232.1	267.2	316.1
T3	317.1	467.4	242.7	191.6	304.7
T4	473.9	416.4	204.8	170.1	316.3
T5	385.1	378.7	248.5	284.7	324.3
T6	338.7	328.4	188.4	128.3	245.9

Table 21 Maize Leaf area Index

	Maize Leaf Area Index (cm2)				
	Plant 1	Plant 2	Plant 3	Plant 4	Avg
T1	2025.2	510.8	1845.7	1504.6	1471.6
T2	1891.9	2326.2	2062.0	2352.2	2158.1
T3	2676.1	1833.3	1823.7	2066.1	2099.8
T4	2747.5	3001.9	1741.4	2176.5	2416.8
T5	2316.8	2314.4	2616.0	2408.5	2413.9
T6	2324.5	1852.9	1310.8	1759.9	1812.0

Table 22 Maize fruit count (cobs) at end of trial

	Maize cob counts				
Treatment	Plant 1	Plant 2	Plant 3	Plant 4	Total
T1	0	0	1	1	2
T2	0	3	3	3	9
T3	1	3	2	3	9
T4	3	2	3	0	8
T5	2	3	2	2	9
T6	2	2	2	3	9

Table 23 Maize average plant root weights

		Maize plant root weight (g)			
Treatment	Plant 1	Plant 2	Plant 3	Plant 4	Avg
T1	15.4	23.8	63.3	6.3	27.2
T2	64.8	98.2	71.6	99.8	83.6
T3	61.8	111.8	94.1	53.2	80.2
T4	110.0	96.9	64.2	23.6	73.7
T5	66.9	89.9	84.2	75.8	79.2
T6	51.6	51.4	82.1	51.0	59.0

Table 24 Maize silk colours at end of trial

		Maize Silk color		
Treatment	Plant 1	Plant 2	Plant 3	Plant 4
T1	green	green	green	green
T2	green	green	green	brown
T3	green	brown	green	brown
T4	green	green	green	green
T5	green	green	green	green
T6	green	green	green	green

Table 25 Plant physiological stage of Maize

	Physiological stage of plant at end of trial			
Treatment	Plant 1	Plant 2	Plant 3	Plant 4
T1	Anthesis	Anthesis	Anthesis/fruit	Anthesis/fruit
T2	Anthesis/fruit	Anthesis/fruit	Anthesis/fruit	Anthesis/fruit
T3	Anthesis/fruit	Anthesis/fruit	Anthesis/fruit	Anthesis/fruit
T4	Anthesis/fruit	Anthesis/fruit	Anthesis/fruit	Anthesis/fruit
T5	Anthesis/fruit	Anthesis/fruit	Anthesis/fruit	Anthesis/fruit
T6	Anthesis/fruit	Anthesis/fruit	Anthesis/fruit	Anthesis/fruit

5.6 Effect of Foliar Application of Konzept Green on wheat growth.

Wheat (Triticum aestivum L.) member of Poaceae family is known as the “king of cereal crops” and is an essential food all over the world. Wheat grain products are one of the main constituents of our daily diet. Wheat is number one food grain crop which is directly consumed by the human beings and leading other cereals like maize, rice, oat, barley, millet, and sorghum in production all over the world. Wheat is a chief food for the inhabitants of South Africa and provides protein and calories necessities more than 60% in everyday diet.

The study was carried out to evaluate the effects of foliar application of Konzept Green on vegetative and reproductive growth, yield, and quality of wheat plants. Data were recorded for plant height, wet biomass, phytotoxicity, water/nutrition over the trial period, tiller counts, ears/ plant, yield, ear weight, chlorophyll content and LAI (Leaf Area Index)

Based on the data submitted: No significant differences in plant heights over the trial period (Fig 20), though T2, T3 and T4 showed significant plant vigour as foliar spray compared to T5 as a root nutrition (Fig 21). Significant chlorophyll readings measured at 2nd spray for T2, T4 and T6 (Fig 22) with an excellent increase in chlorophyll content at the end of the trial for T2, T3, T4 and T6 as foliar sprays (Fig 23). Significant average biomass was recorded for T2, T4 and T6 (Table 27)

Fig 20 Wheat plant heights

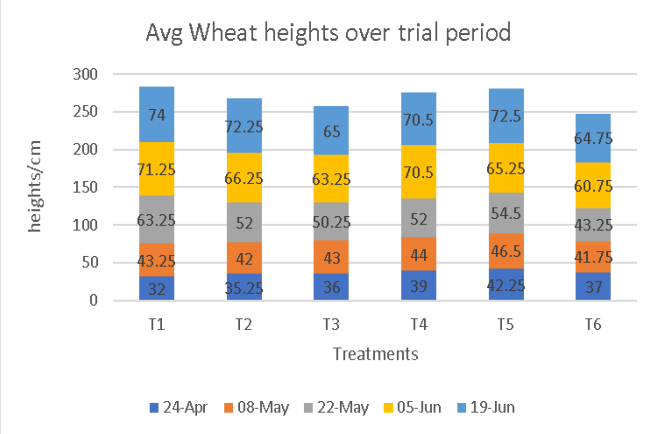


Fig 21 Wheat plant growth vigour

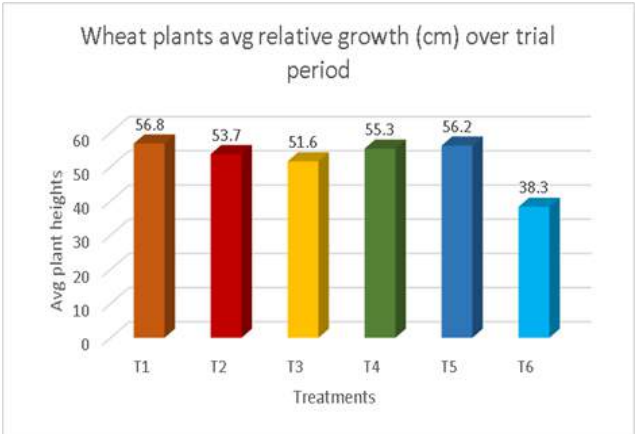


Fig 22 Wheat Chlorophyll at 2nd spray

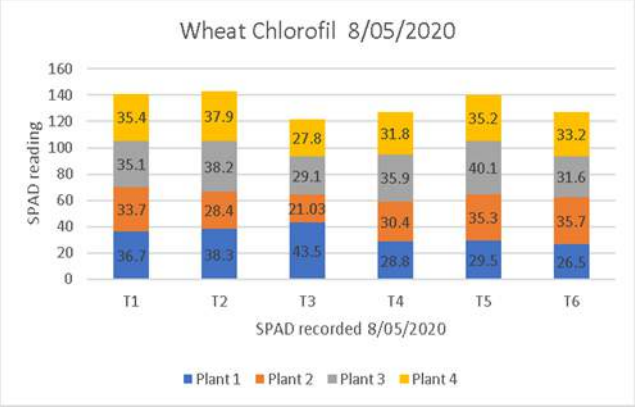


Fig 23 Wheat Chlorophyll at end of trial

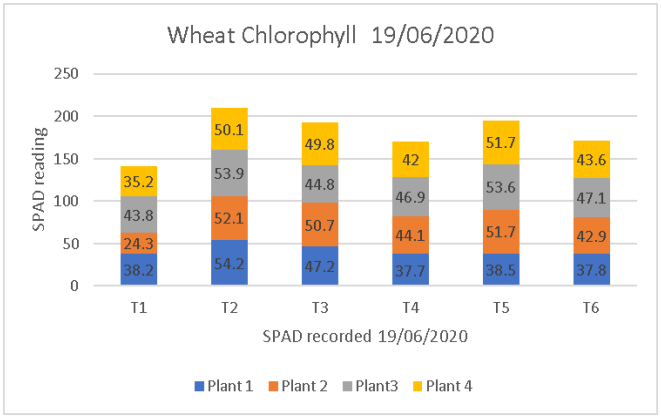


Table 26 Wheat ear counts

		Wheat ear counts			
Treatment	Plant 1	Plant 2	Plant 3	Plant 4	Total
T1	2	4	3	4	13
T2	3	6	4	4	17
T3	4	6	2	4	16
T4	6	6	4	7	23
T5	8	6	5	4	23
T6	6	6	6	3	21

Table 27 Wheat wet biomass

	Wheat wet Biomass (g)				
Treatment	Plant 1	Plant 2	Plant 3	Plant 4	Avg
T1	19.75	20	28.91	64.43	33.3
T2	44.4	51.72	45.91	53.71	48.9
T3	29.26	37.46	19.86	11.81	24.6
T4	32.6	47.62	51.14	47.72	44.8
T5	32.66	50.43	51.55	57.08	47.9
T6	32.61	83.25	21.69	32.02	42.4

Table 28 Average ear weights

	Average ear weight (g)				
Treatment	Plant 1	Plant 2	Plant 3	Plant 4	Avg
T1	4.83	2.67	8.16	11.02	6.7
T2	8.68	9.82	8.09	6.9	8.4
T3	7.48	6.32	4.29	0	4.5
T4	3.69	4.42	13.13	10.08	7.8
T5	2.42	11.13	18.16	4.89	9.2
T6	4.21	12.45	3.06	9.42	7.3

Table 29 Total wheat plant tillers

	Wheat plant tillers at end of trial				
Treatment	Plant 1	Plant 2	Plant 3	Plant 4	Total
T1	2	4	3	4	13
T2	3	6	4	4	17
T3	4	6	2	4	16
T4	6	6	4	7	23
T5	8	6	5	4	23
T6	6	6	6	3	21

Table 30 Wheat plant physiological stage at end of trial

Wheat plant physiological stage at end of trial				
Treatment	Plant 1	Plant 2	Plant 3	Plant 4
T1	grain fill& spike	grain fill& spike	grain fill& spike	grain fill& spike
T2	grain fill& spike	grain fill& spike	grain fill& spike	grain fill& spike
T3	grain fill& spike	grain fill& spike	grain fill& spike	grain fill& spike
T4	grain fill& spike	grain fill& spike	grain fill& spike	grain fill& spike
T5	grain fill& spike	grain fill& spike	grain fill& spike	grain fill& spike
T6	grain fill& spike	grain fill& spike	grain fill& spike	grain fill& spike

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Conclusion / Remarks

The above-mentioned greenhouse trial was conducted under controlled conditions as outlined in this report. Certain quantitative parameters could be measured within the trial growth period which last 56 days as per trial protocol and reported as such.

Notable: Treatment 6 received 50% less water throughout the trial period. Despite the simulation of “drought stress” conditions in treatment 6, the plants showed great resilience and growth persistence where in most cases they outperformed Treatment 1 (control).

Recommendation: Conduct an external field trial till harvesting / maturation of plants/crops to validate this greenhouse trial

For future recommendation when using Konzept Foliar Plant Booster or any foliar spray on canola (smooth leave surface), please ensure the use of a surfactant (wetting agent).

Dried leaf- biomass samples will be sent to the Animal Husbandry Laboratory at Department of Agriculture for qualitative analysis.

In respect of the above review it can be concluded and suggested that the foliar plant mineral nutrients of Konzept Green will improve the vegetative and yield components of crops as outlined in this report and also very beneficial when roots are unable to absorb the nutrients from soil due to the interference of various edaphic factors such as low soil temperature, lack of soil moisture and loss of nutrients due to leaching. So, Konzept Green foliar application can be considered as the beneficial practice to produce crops.

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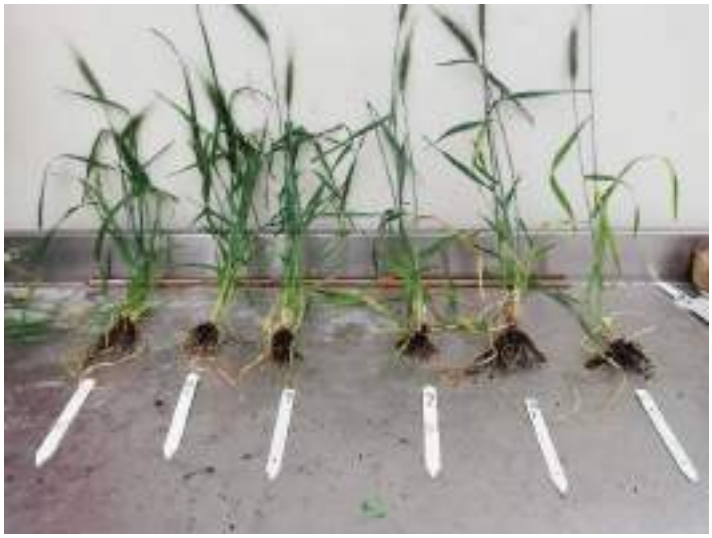
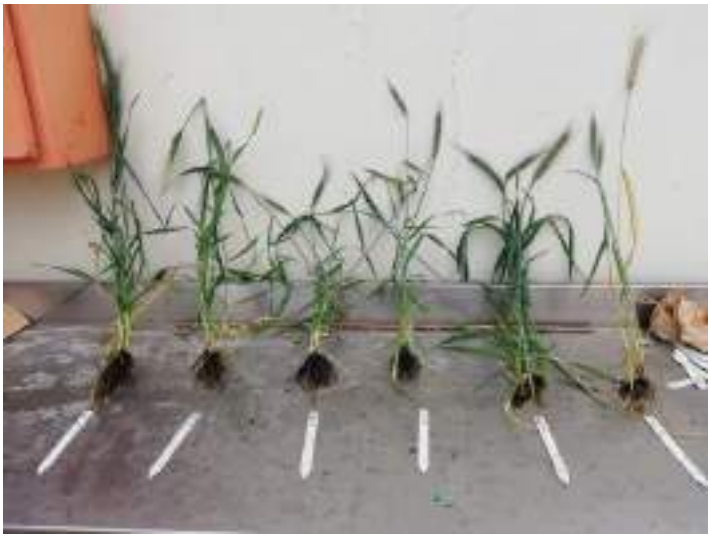
Appendix A

Wheat plant & root Rep 1

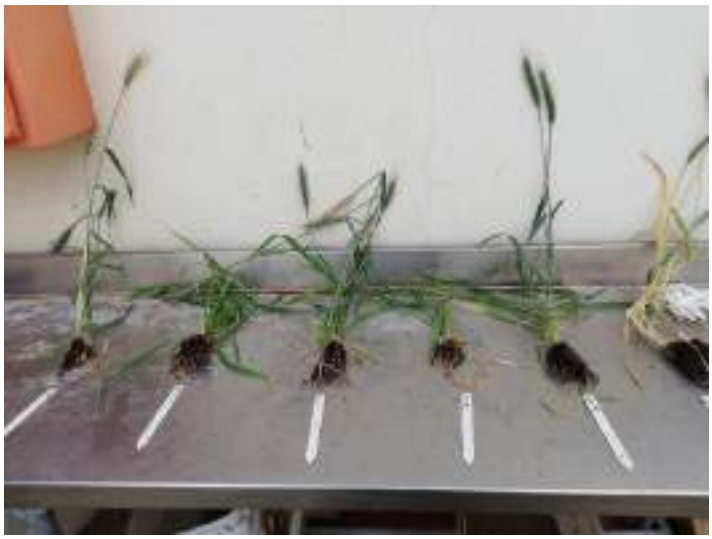


Wheat plant & root Rep 2



Wheat plant & root Rep 3

Wheat plant & root Rep 4



Appendix B

Canola plant & roots Rep 1

Canola plant & roots Rep 2

Canola plant & roots Rep 4

Appendix C

Canola plant Rep 1

Canola plants Rep 3

Canola plants Rep 4

Appendix D

Spinach plant Rep 1

Spinach plant Rep 2

Spinach plant Rep 3

Spinach plant Rep 4

Appendix E

Bean plants Rep 1

Bean plants Rep 2

Bean plants Rep 3

Bean plants Rep 4

Appendix F

Tomato plants Rep 1

Tomato plants Rep 2

Tomato plants Rep 3

Tomato plants Rep 4

Appendix G

Maize plants Rep 1

Maize plants Rep 2

Maize plants Rep 3

Appendix H

Bean plants & roots Rep 1

Bean plants & roots Rep 2

Bean plant & roots Rep 3

Bean plants & roots Rep 4

Appendix I

Spinach plants & roots Rep 1

Spinach plants & roots Rep 2

Spinach plants & roots Rep 3

Spinach plants & roots Rep 4

Appendix J

Maize roots Rep 1

Maize roots Rep 2

Maize roots Rep 3

Maize roots Rep 4

Appendix K

Tomato plants & roots Rep 1

Tomato plants & roots Rep 2

Tomato plants & roots Rep 3

Tomato plants & roots Rep 4

Appendix L

Wheat plants Rep 2

Wheat plants Rep 3

Wheat plants Rep 4