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Digital Analyzation Study of Grey Tone Degrees Signals of Some Crops, Vegetables and Urban within Radar Image Utilizing Colorimeter Software

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Abstract: ***Since, the continuous tone defined the degree of lightness or darkness in any given area of a print; also referred to as value. Cold tones (bluish) and warm tones (reddish) refer to the color of the image in both black-and-white and color photographs. In addition, because film cannot record all of the tones a human eye can see and offset lithography cannot reproduce all of the tones recorded by a photograph; this process eliminates, or compresses, tones during the reproduction process is called tonal compression. In this respect, Wooding (1988) exposed essential turbid as the radar has limited sensitively to the emerging crops and the dark tones are essentially those relating to the smooth surface of the bare soil. Hence the immediate investigation was presented digital coloring analyzation study of grey tone degrees of various targets through black and white radar image taken by Convair aircraft (SAR 580) was previously visual classified by Wooding (1988) however the image covers small area around the village of Fellwall, East Angila, UK, was taken in the middle of the crop growing season on 30 June 1981; as plight/troth source to basic data was requirement to terms of presently investigation.***

Keywords: Wooding (1988); (SAR 580); Colorimeter Software; signals grey ton; Crops; Vegetables

1. Introduction

(Colwell *et. al.*, 1970) presented tone-signature keys for various crops that are valuable aids to photo interpretation. (Harris *et. al.*, 1976) used the aerial photography technique to positively identify all Pecan trees in an area. Other species of trees were in full foliage, so Pecan stress appeared dark and other trees appeared red. (Kartens *et. al.*, 1980). (Abdel Samie *et. al.*, 1982) found that, orchards, similar to vegetation, have the same tone i.e. dark grey in blue and red bands, light grey in green band and white in IR band. However, the mottled crown shape and the clear coarse texture can easily delineate them. Grape yards as they show in the photos appeared with light grey tone in blue, green and red bands, and with dark grey in IR band. The reflectance from the grapevines is due to the combined reflectance of grape leaves and the wooden frames on which they grow. The netted shape and the coarse texture easily distinguished wooden frames of grape. Palm trees appear with light grey tone in blue and red bands because lower chlorophyll content of their leaves causes less absorption of blue and red lights. The branched shape, the clear shadow and the coarse texture delineated palm trees. (Aboul-Eid *et. al.*, 1983) described the tree crowns of apricot, apple, lime, mango, olive, orange, old peach, pear and prune as it appeared in the four bands: the blue (band 1), the green (band2), the red (band 3), and the near infrared (band 4) in black and white multispectral aerial photographs. It was also possible to differentiate the orange variety thornless, which has more white crowns in the green or red bands, while the crowns of both Valencia (seifi), and Baladi varieties have darker crowns in the same photographs. Several apricot trees suffering from gummosis disease were clearly identified in the near infrared band while photographs of blue, green, or red bands did not detect this disease. (Everitt *et. al.*, 1987) reported that, the results indicate the CIR aerial photography with computer-aided image processing may be useful technique to detect drought stress of grasses. The behavior of radiation in or at the epidermis of leaves and non- woody stems, in the pigment cells of chlorophyll, xanthophyll, and carotene, and in the reticulation of the paranchyma. The epidermis and pigments of leaves are very transparent to infrared. Thus the radiation has free access to the paranchyma, by the same token, the green, yellow, and IR (but no red) radiation, which are strongly reflected from the mesophyll, readily energy from the leaf to give it a green color and a bright characteristic in the IR. Hence, foliage appears light-toned in an IR photograph. On the other hand, (Blazquez *et. al.*, 1992) used aerial color infrared photography to select three blocks of citrus grove for image analysis. The three blocks were counted and classified according to stress percent and canopy growth. Measurement were done on the positive color infrared transparency with a scanning denistometer over the (500-520) and (600-620) nm spectral range, correlated with visual grades in surveying. Found that, denistometer may be a good tool for interpretation because there were not any effects from the different color balance or the hue. (Hammad, 2003) used Colortron software undertaken on fresh sampled newly developing panicles (normal & malformed) of four mango cultivars under study with 3 replication per each. Whereas, three color tests namely (RGB), (XYZ) and (HSB) were investigated in relation to cultivar combined with panicles sprouting state. (Reich and Wehr 2004) analyzed ERS-1/-2 SAR data as a tool for agricultural crop monitoring. The focus is to apply the data for crop (winter wheat, winter barley, summer barley, oat, rape and corn) identification. This analysis is supported by combining ERS SAR data with optical satellite images and non remote sensing data in a Geographical Information System. First results concerning the detection of changes in agricultural land use are presented and show that interferometric processing of ERS-

1/ERS-2 SAR data and analysis of the resulting coherence images is an important step for the monitoring of the agricultural land use by remote sensing methods: No other remote sensing data can display the farming activities in a similar way. Also coherence information can improve multi-sensoral/multi-temporal classification accuracy especially in all cases where no data from optical sensors are available. The non agricultural areas (red = urban, dark green = forest, light green = grassland) have been masked and the corresponding pixels were not used for the classification. We could only separate with an accuracy of about 80 % between two groups: one group consists of winter wheat, summer barley and oat and the other one of winter barley, rape and corn. Forest areas and highways show up as dark areas, i.e. as areas with low coherence. Agricultural fields appear in general quite bright, but in all images there are always some fields which appear dark, i. e. with low coherence. Also the detection of farmers activities can be helpful for classification, because the knowledge of field activities at a certain time of the year allow the agricultural experts to extract information about the type of vegetation. However to make use of this information a more sophisticated system is necessary rather than conventional ML- or NN- classification methods. SAR acquisition taken in the middle of the vegetation period can substitute the information contained in an optical remote sensing image. Also the author showed that coulor composite of 3 coherence images of the "Weilerswist" test site red = coherence image 3 (07.03.1994 + 10.03.1994) green = coherence image 4 (10.03.1994 + 13.03.1994) blue = coherence image 5 (13.03.1994 + 16.03.1994).

The current study included measuring grey tone degrees of 15 signals in various grey ton degrees of variety crops and vegetables as (Winter Wheat, Winter Barley, Spring Wheat, Spring Barley, Potatoes, Sugar Beet, Onions, Carrots, Grass, Beans, Peas and Kale) at which in immediate study the winter barley was visual divided to light tone degree (Winter Barley-a), middle tone degree (Winter Wheat-b) and (Winter Wheat-c) dark tone degree promotion Urban/Village signals tone was measured. The grey tone signal of crops and urban were analyzed via measurements the average of 5 pixels from each 15 various samples corresponding grey scale of crops and urban carried with image whereas that were taken with collection by putting to use colorimeter software to measure RGB (0-255), HSL (0-239) and HTML, Adobe Photoshop software was used after that to finding out CMYK % values subsequently electronic grey tone (grey scale) consistently with 15 various samples grey tone degrees. Color calculator software was used to checkup of coloring data accuracy. The analysis performed to investigate the visual grey tone characteristic of crops and urban grey grades creating with the image. The goal of this study in order to an assistant of accuracy interpretation to any kind of image/photo black and white or color composite subsequently helpful of GIS process. The study presented demonstration to facility of digital identified and separated of various grey tone degrees of targets.

2. Methodology

The actually investigation emphasized analyzation study of grey tone signal characteristics usage reconversion of radar image incorporated 12 crops was visual grades classified to (winter wheat, spring wheat, winter barley, spring barley, potatoes, sugar beet, onions, carrots, grass beans, peas and kale) over and above urban/village at which the image was finding out by Wooding (1988): Imaging radar applications in Europe. Illustrated experimental results (1978-1987), "crop discrimination is using a single radar image" in chapter 2, pages 8-9. The grey tone signal of crops and urban were analyzed via measurements the average of 5 pixels from each 15 various samples corresponding grey scale of crops and urban carried with image whereas that were taken with collection by putting to use colorimeter software to measure RGB (0-255), HSL (0-239) and HTML, Adobe Photoshop software was used after that to finding out CMYK % values subsequently electronic grey tone (grey scale) consistently with 15 various samples grey tone degrees. Color calculator software was used to checkup of coloring data accuracy. The analysis performed to investigate the visual grey tone characteristic of crops and urban grey grades creating with the image. The image taken by technique radar system SAR 580, platform Convair aircraft 7000m, wavelength X band, polarization HH and scale 1km; the image was presented ideal models for this respect. At which, the RGB model, assigning an intensity value to each pixel ranging from 0 (black) to 255 (white) for each factor of RGB components in a grey grades of image. Wooding (1988) reported that, although there broad relationship between image tones and the crop types. Variability in crop growth stages and conditions in particular fields does complete the situation. For example, fields of winter barley have a particularly wide range of image tones which are actually related to different degrees of wind blow damage. So in the instantaneous study the winter barley was visual divided to light tone degree (winter barley-a), middle tone degree (Winter Wheat-b) and (Winter Wheat-c) dark tone degree.

At which, the RGB model, assigning an intensity value to each pixel ranging from 0 (black) to 255 (white) for each of the RGB components in a color image. For example, a bright red color might have an R value of 246, a G value of 20, and a B value of 50. When the values of all three components are equal, the result is a shade of neutral gray. When the value of all components is 255, the result is pure white; when the value is 0, pure black www.Help\help.html & Adobe Photoshop's document "RGB mode ". www.HSL Selected (Hue, Saturation, Light) Color Codes demonstrates the hue, saturation, and light (HSL) representation of color of the form HSL (H°, S%, L%), where H is the hue measured in degrees of the color circle ranging from 0 to 360 (red = 0°; green = 120°; blue = 240°). S is the saturation percent (100% full saturation, 0% is a shade of gray); L is the lightness percent (100% is white, 0% is black, 50% is 'normal'). www.CMYK Selected Color Codes lists the CMYK (Cyan-Magenta-Yellow-black) representation of color of the form CMYK (C%, M%, Y% & K %), where C, M, Y, and K are the percent values for the cyan, magenta, yellow, and black values of the color. The CMYK color system is used in printing inks for paper. www.Help\help.html & Photoshop's document "CMYK model" is based on the light-absorbing quality of ink printed on paper. As white light strikes translucent inks, certain visible wavelengths are absorbed while others are reflected back to your eyes. In theory, pure cyan (C), magenta (M), and yellow (Y) pigments should combine to absorb all light and produce black. For this reason these colors are called subtractive colors. Because all printing inks contain some impurities, these three inks actually produce a muddy brown and must be combined with black (K) ink to produce a true black. (K is used instead of B to avoid confusion with blue.) Combining these inks to reproduce color is called four-color process printing. The subtractive (CMY) and additive (RGB) colors are complementary colors. Each pair of subtractive colors creates an additive color, and vice versa. www.Hex Color Codes demonstrates the six-digit hexadecimal representation of color of the form #RRGGBB, where RR, GG, and BB are the hexadecimal values for the red, green, and blue values of the color. Using a hexadecimal code is the most reliable of the several ways you can define colors in HTML or style sheets. www.HTML Colors explained that, colors are defined using a hexadecimal notation for the combination of Red, Green, and Blue color values (RGB). The lowest value that can be given to one light source is 0 (hex #00). The highest value is 255 (hex #FF).

3. Results and Discussion

The color coordinates (RGB, CMYK, HSL, HTML /Hex triplet) measurements and grey tone assay/grey scale were principle components as grey pulsation data of 15 various samples of targets crops and urban. Data source was getting from radar image by **Wooding (1988)** (Fig.1) presented the crop places were selected to measure grey tone degrees. The RGB, CMYK and HSL data were presented in (Fig. 2-4) where the crop elements and urban were explaining and categorized. All data was recreated in a Table 1. The data of parameters measurements were given special prominence force as follow:

RGB (basic colors) component

Overview, the data corroborated that R, G and B columns in the Table 1 and (Fig. 2 a-c) whereas data was distributed.
The columns data manifested as relationship asymptotical approximately with grey tone degrees. Meanwhile, Table 2 and (Fig. 5a and b) showed the targets data were categorized as ratio8:4:1:1:1for format R=G>B, G>R>B, G>B>R, B>G>R and G>R=B so the format related to (PE,C,P,K,O,WW-b, SB & BE), (G, WW-a, SW & WW-c) thus the targets Sugar Beet (B), Winter Barley (WB) and Urban (U) were clearly separated.

On the other hand, the data was classified in Table (3-a) and (Fig. 6 a-e) whereas in Class I the targets data were clear identify and separated as ratio 13:13:12 for R, G and B colors indicated to (PE, C, B, G, K, U, WW-a, SW, O, WW-b, SB, WW-c & BE), (PE, WB, P, G, U, K, WW-a, SW, O, WW-b, SB, WW-c & BE) and (PE, P, G, U, K, WW-a, SW, O, SB, WW-b, WW-c & BE). In Class II (8) targets (PE, C, P, K, O, WW-b, SB, BE & U) were marked as the same values with (R and G) as common actor also as the same mode found that Urban (U) was isolated by way of common actor (R and B).

In addition, Class III the values were fixed with two varieties targets by means of two different basic colors whereas 116 (C & B), 114 (B & W), 100 (G & U) and 94 (WW-a & SW) connected with (R & G) finally 99 (G & K) were identify with (R & B). In another analyzed, at which the combination of (R+G+B) giving up full separated for all targets see Combination column and row (R+G+B) in Table (3-a) and (Fig.7-a). Reversed that R, G and B columns in (Table 3-b) some data were not identify because of that the tow or more varieties targets were obtained the same value in each basic colors (isotropic/conjoined) as WB/P (113) in R color, C/B (116) in G color and B/WB/C (115) in B color.

CMYK% (subtractive colors) component

Nevertheless, the data demonstrated that C, M, Y and K columns in the Table 1 and (Fig. 3 a-d) whereas data was distributed. Table 2 and (Fig. 6 a-b) exposed the targets data were indexed as ratio11:2:1:1for format C>Y>M>K, C>Y=M>K, C=Y>K>M and C>M>Y>K thus the format correlation with (WW-c, WW-b, SB, O, SW, WW-a, U, K, G, B & PE), (C & P), (BE) and (WP).

In this respect, the data was identified in Table (3-a) and (Fig. 9 a-e) whereas in Class I the targets data were clear identify and separated as ratio5:4:7:8for C, M, Y and K colors connected with (BE, WW-c, O, SW & PE), (BE, SW, WW-a & PE), (BE, SB, O, K, G, U & PE) and (BE, WW-c, O, SW, WW-a, K, P & PE). In Class II (BE) just was the same value (68) in (C & Y).

In Class III at which (O/BE) 65, (SW/BE) 62, (PE/SW/G) 53 and (WW-a/U) 52 were defined with subtractive colors (C & K), (C & M), (C, M & Y) and (M & Y) successively. In CMYK combination in the same Table (Fig.7-b) 13 targets were clearly separated. Contrary to, C, M, Y and K columns in (Table 3-b) was featured comparison data among some targets whereas not identify (isotropic) as: SB/WW-b (66), WW-a/U (61), G/K (60), WB/B (57), P/C (56) in C color, WW-c/SB (59) WW-b/O (58) K/U/G (51) P/WB (48) C/B (47) M color, WW-c/WW-b (62) SW/WW-a (55) P/B (48) WB/C (47) in Y color and SB/WW-b (44) U/G (22) B/WB/C (13) in K color. In addition, B/WB (165) were not identify with CMYK combination.

HSL (basic colors) component

Unlike previously, H, S and L columns in the Table 1 and (Fig.4 a-c) the data was distributed. Table 2 and (Fig. 10) exhibited the trend data format at which all targets followed L>H>S unless Winter Barley was followed H>L>S. It is quite evident as shown from tabulated data in Table (3-a) and (Fig. 11 a-b) the data was classified inside of Class I whereas some targets were characteristic quality with H as WB (150), B (100), U (76), C (71), P (70), WW-b (63), WW-c (54), SW (46), SB (43), PE (41) and K (38).

In Class II Winter Wheat-b in H followed as the same value (63) of Spring Barley in L. Besides 3 preferentially targets were appearances in S as Beans (15) Wheat-b (12) Winter Barley (1). On the other side, all data were senseful with L and HSL combination. Opposite to previously, in Table (3-b) the little data was not discriminated (isotropic) as comparison within the targets: WW-a/G (58) and O/BE (37) in H factor and WW-c/O/WW-a/SB/K (4) SW/G/P/U (3) B/C/PE (2) in S parameter.

HTML/ hexadecimal measurements and color assay/scale color

For consistency of the grey ton degrees data the hexadecimal and scale color were setting referring to each grey ton degree of various targets. Wooding (1988) noted that, fields with lightest tone on the image are mainly sugar beet and potato crops. The rough surface associated with these row crops is primarily responsible for the high radar returns causing the light image tone. Many of the fields with medium grey tones on the image contain cereal crops: winter wheat, winter barely and spring barley. These crops were into ear at the time of imaging. Grass fields have a similar appearance on the image. These crops are intermediate in terms of surface roughness and the strength of the radar return. The darkest fields on the image are those with beans, carrots, and other vegetables.

4. Conclusion

Over all look, Nevertheless, the color coordinates (RGB, CMYK, and HSL) were different characteristics with the various and/or single target however found format trend was more judgmental in RGB and CMYK than HSL. The data corroborated that R, G and B characteristics as relationship asymptotical approximately with grey tone degrees. The data demonstrated that RGB was vice verse with CMYK for that reason RGB was more identified of data than CMYK. Bringing to light view, Winter Barley was isolated format in RGB, CMYK and HSL. In order to summarization of the results Table 4 illuminated this respect at which the percentages of ability to discriminated within the targets in R, G, B and combination RGB were (93%, 93% and 87%), in C, M, Y and K and combination CMYK were (67%, 60%, 73% and 93%) and in H, S, L and combination HSL were (87%, 40%, 100% and 100%). On the other hand, Peas was the highest value and Beans was lowest value than other values in R, G, B, combination RGB and L; this result was vice verse with C, M, Y and K and combination CMYK however Winter Barley was highest value and Beans was lowest value in H and combination HSL and this result was vice verse with S. Some targets values was isotropic/conjoined in (R, G and B), (C, M, Y and K and combination CMYK) and (H and S) subsequently this target not defined see Table 4. Contrary to trends format were identified as follow:

a) In (RGB):
1) Peas, Carrots, Potatoes, Kale, Onions, Winter Wheat-b, Spring Barley and Beans followed R=G>B format.
2) Grass, Winter wheat-a, Spring Wheat and Winter Wheat-c followed G>R>B format.
3) Sugar Beet followed G>B>R format.
4) Winter Barley followed B>G>R format.
5) Urban followed G>R=B format.

b) In (CMYK):
1) Winter Wheat-c, Winter Wheat-b, Spring Barley, Onions, Spring Wheat, Winter wheat-a, Urban, Kale, Grass, Sugar Beet, and Beans followed C>Y>M>K format.
2) Beans followed C=Y>K>M format.
3) Winter Barley followed C>M>Y>K format.
4) Carrots and Potatoes followed C>Y=M>K format.

c) In (HSL): all targets followed L>H>S unless Winter Barley was followed H>L>S.
With regard to variety parameters detected various targets with the same values state positively that:
1) Red color identify to Carrots, Sugar Beet, Grass and Winter wheat-a.
2) Green color detected Sugar Beet, Winter Barley, Urban and Spring Wheat.
3) Blue color detected Kale.
4) Cyan color discriminated Onions, Spring Wheat and Peas.
5) K color detected Beans.
6) Magenta color sensed to Spring Wheat and Winter Wheat-b.
7) Yellow color discriminated Grass and Urban.

Contrary to, the result indicted to usage red color with green or blue color as the same time to detected previously target may be became not identify. This case was as the same with using cyan color with black color or magenta color. Also when used cyan with magenta or yellow as once. In addition, Variety parameters detected the same targets with the same values verify Red and Green sensing Peas, Carrots, Potatoes, Kale, Onions, Winter Wheat-b, Spring Barley and Beans. Also the Urban detected by Red and Blue. Furthermore, Cyan and Yellow defined Beans.

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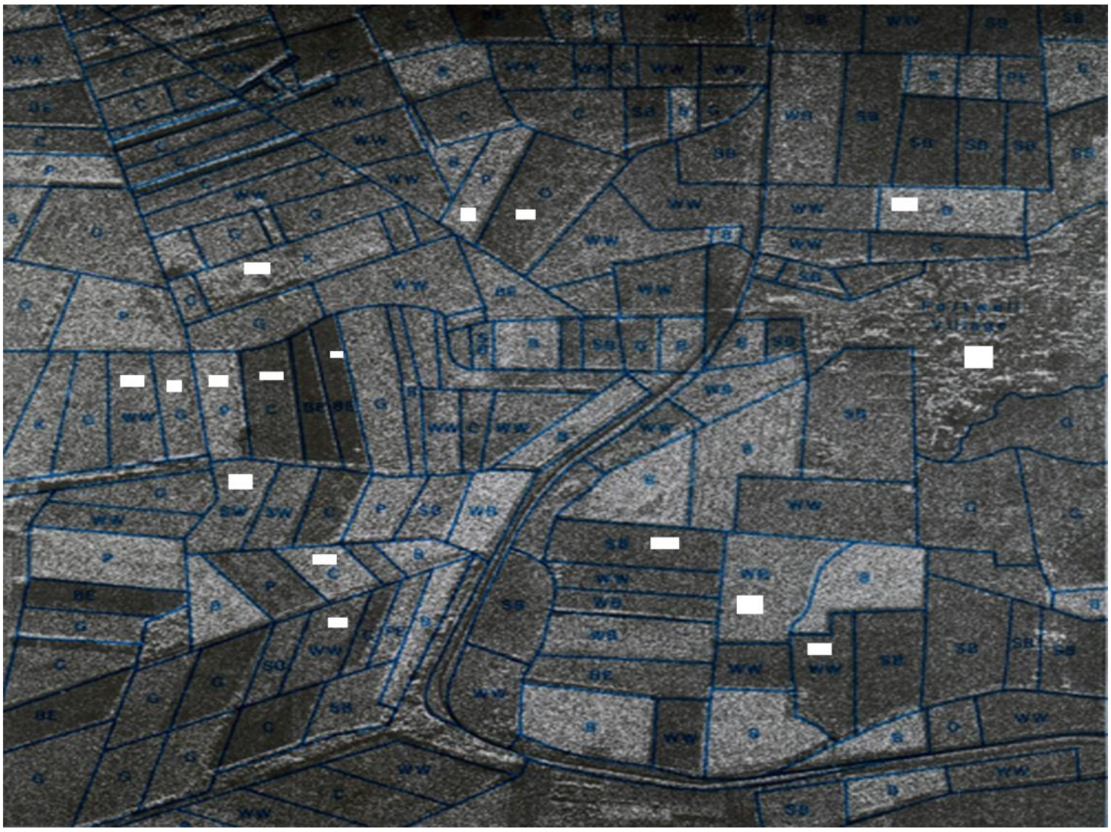

Figure 1: Presented 12 crops was visual grades classified to Winter Wheat (WW), Spring Wheat (SW), Winter Barley (WB), Spring Barley (SB), Potatoes (P), Sugar Beet (B), Onions (O), Carrots (C), Grass (G), Beans (BE), Peas (PE) and Kale (K). image taken by technique radar system SAR 580, platform Convair aircraft 7000m, wavelength X band, polarization HH and scale 1km classified by Wooding (1988). The white marked indicated to measuring samples positions of 15 targets included Winter Wheat a) light tone (WW-a), Winter Wheat b) middle tone (WW-b), Winter Wheat c) dark tone (WW-c) and Village (U).

Table: (1) Color coordinates RGB, HSL, CMYK, HTML and grey tone scale assay of radar image incorporated 12 crops was visual grades classified to 15 tone (winter wheat: a) dark tone, image b) middle dark tone c) light tone, spring wheat, winter barley, spring barley, potatoes, sugar beet, onions, carrots, grass beans, peas and kale) also urban target.

Key words	Color tests / Crops & Urban	RGB (0-255)				CMYK %					HSL (0-239)				HTML	Grey Tone
		R	G	B	R+G+B	C	M	Y	K	C+M+Y+K	H	S	L	H+S+L		
WW-a	Winter wheat a) light tone	94	95	92	280	61	52	55	25	193	58	4	87	149	#5E5F5C	
WW-b	Winter Wheat b) middle tone	70	70	66	206	66	58	62	44	229	63	12	66	141	#464642	
WW-c	Winter Wheat c) dark tone	64	65	62	191	67	59	62	47	236	54	4	59	118	#40413E	
SW	Spring Wheat	93	94	91	278	62	53	55	26	196	46	3	86	135	#5D5E5B	
WB	Winter Barley	113	114	115	342	57	48	47	13	165	150	1	106	257	#717273	
SB	Spring Barley	69	69	67	205	66	59	60	44	228	43	4	63	110	#454543	
P	Potatoes	113	113	112	338	56	48	48	14	166	70	3	105	178	#717170	
B	Sugar Beet	114	116	115	344	57	47	48	13	165	100	2	107	209	#727473	
O	Onions	73	73	71	217	65	58	59	40	222	37	4	67	109	#494947	
C	Carrots	116	116	115	347	56	47	47	13	163	71	2	108	181	#747473	
G	Grass	100	101	99	300	60	51	53	22	185	58	3	93	154	#646563	
BE	Beans	45	45	40	131	68	62	68	65	263	37	15	40	91	#2D2D28	
PE	Peas	123	123	121	367	53	44	46	10	153	41	2	114	157	#7B7B79	
K	Kale	99	99	96	294	60	51	54	23	188	38	4	91	132	#636360	
U	Urban	98	100	98	296	61	51	52	22	186	76	3	92	171	#626462	
	Average	92	93	91		61	52	54	28		63	5	86			

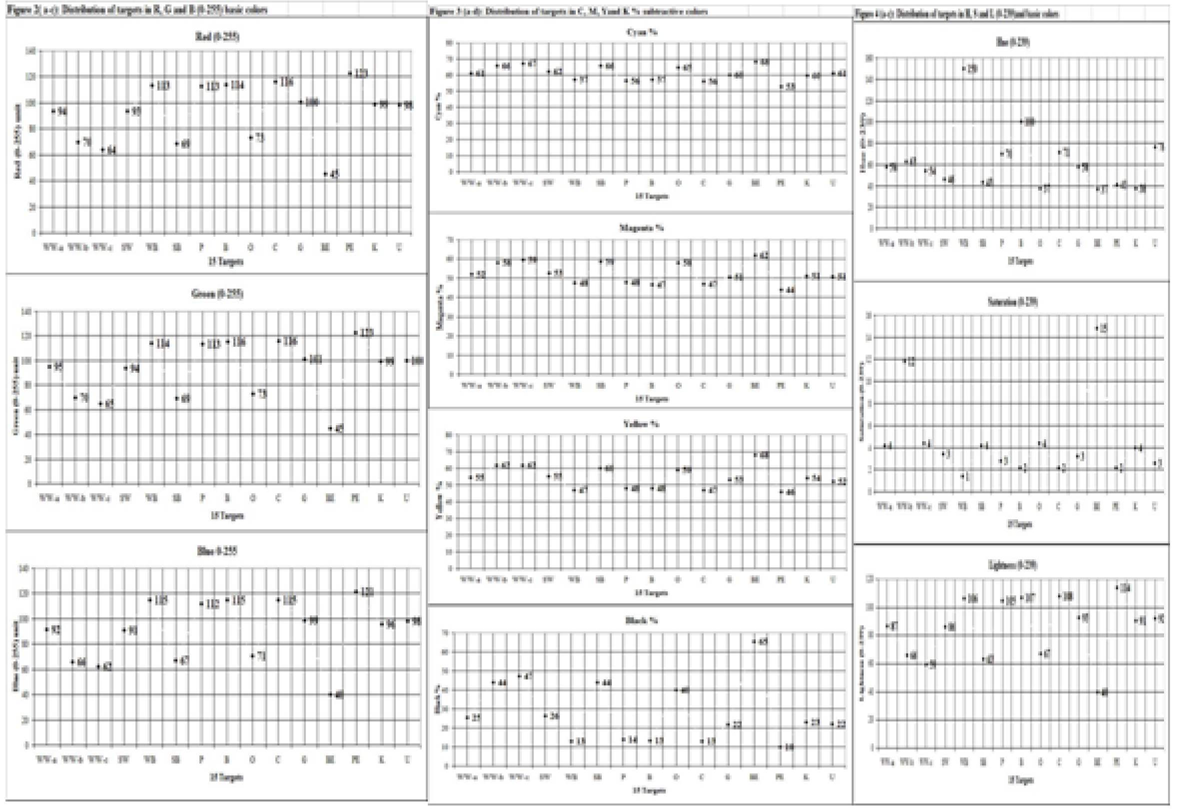

Figure 2(a-c): Distribution of targets in R, G and B (0-255) basic colors

Figure 3 (a-d): Distribution of targets in C, M, Y and K % subtractive colors

Figure 4 (a-c): Distribution of targets in H, S and L (0-239) basic colors

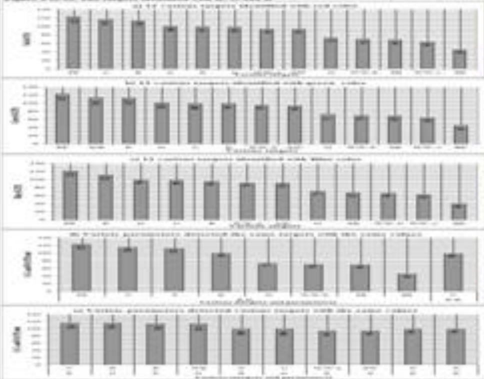

Table 2: Different format of 15 targets in (RGB, CMYK and HSL) components

	R	G	B		C	M	Y	K		H	S	L
R=G>B				C>Y>M>K					L>H>S			
PE	123	123	121	WW-c	67	59	62	47	WW-a	58	4	87
C	116	116	115	WW-b	66	58	62	44	WW-b	63	12	66
P	113	113	112	SB	66	59	60	44	WW-c	54	4	59
K	99	99	96	O	65	58	59	40	SW	46	3	86
O	73	73	71	SW	62	53	55	26	SB	43	4	63
WW-b	70	70	66	WW-a	61	52	55	25	P	70	3	105
SB	69	69	67	U	61	51	52	22	B	100	2	107
BE	45	45	40	K	60	51	54	23	O	37	4	67
G>R>B				G	60	51	53	22	C	71	2	108
G	100	101	99	B	57	47	48	13	G	58	3	93
WW-a	94	95	92	PE	53	44	46	10	BE	37	15	40
SW	93	94	91	C>Y>K>M					PE	41	2	114
WW-c	64	65	62	BE	68	62	68	65	K	38	4	91
G>B>R				C>M>Y>K					U	76	3	92
B	114	116	115	WB	57	48	47	13	H>L>S			
B>G>R				C>Y=M>K					WB	150	1	106
WB	113	114	115	C	56	47	47	13				
G>R=B				P	56	48	48	14				
U	98	100	98									

Figure 7(a-b): The targets defined with different format of RGB

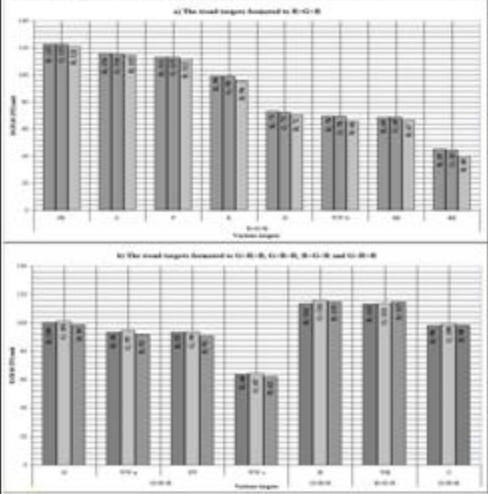

Table 3-a: The classes of the targets identify with (RGB, HSL (0-239) and (CMYK %) parameters and (RGB, HSL and CMYK) combinations

Class															
Class I (R)	PE	C	B	G	K	U	WW-a	SW	O	WW-b	SB	WW-c	BE		
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Class I (G)	PE	WB	P	G	U	K	WW-a	SW	O	WW-b	SB	WW-c	BE		
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Class I (B)	PE	P	G	B	K	WW-a	SW	O	SB	WW-b	WW-c	BE			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Class II (R=G)	PE	C	P	K	O	WW-b	SB	BE	U						
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
Class III	Red / Green	C / B	116	B / WB	114	G / U	100	WW-a / SW	84	Red / Blue	G / K	99			
Class I (C)	BE	WW-c	O	SW	PE										
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]										
Class I (M)	BE	SW	WW-a	PE											
	[illegible]	[illegible]	[illegible]	[illegible]											
Class I (Y)	BE	SB	O	K	G	U	PE								
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								
Class I (K)	BE	WW-c	O	SW	WW-a	K	P	PE							
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							
Class II (C=Y)	BE														
	[illegible]														
Class III	Cyan / Black	O / BE	63	Cyan / Magenta	SW / BE	62	Cyan / Magenta / Yellow	PE / SW / G	53						
Class I (H)	WB	B	U	C	P	WW-b	WW-a	SW	SB	PE	K				
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
Class I (S)	BE	WW-b	WB												
	[illegible]	[illegible]	[illegible]												
Class I (L)	PE	C	B	WB	P	G	U	K	WW-a	SW	O	WW-b	SB	WW-c	BE
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Class II	Hue / Lightness	WW-b / SB	63												
combination (R+G+B)	PE	C	B	WB	P	G	U	K	WW-a	SW	O	WW-b	SB	WW-c	BE
	367?	347	344	342	338	300	296	294	280	278	217	206	205	191	133
combination (C+M+Y+K)	BE	WW-c	WW-b	SB	O	SW	WW-a	K	U	G	P	C	PE		
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
combination (H+S+L)	WB	B	C	P	U	PE	G	WW-a	WW-b	SW	K	WW-c	SB	O	BE
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Figure 7 (a-c): The targets identify with (RGB, HSL and CMYK) combinations

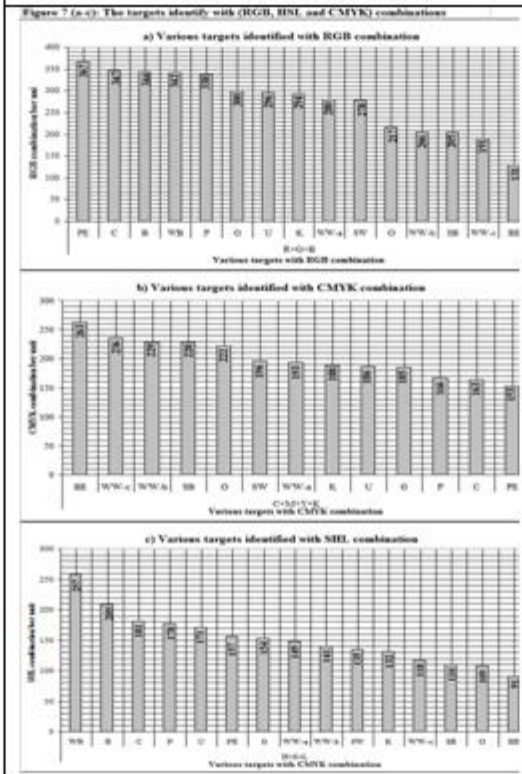

Table 3-b: The targets non-Identify (isotropic/conjoined) with (RGB, HSL (0-239) and CMY %) parameters and CMYK combin

RGB	R	G	B		
	WB=P	C=B	B=WB=C		
	113	116	115		
CMYK	C				
	SB=WW-b	WW-a=U	G=K	WB=B	P=C
	66	61	60	57	56
	M				
	WW-c=SB	WW-b=O	K=O=U=G	P=WB	C=B
	59	58	51	48	47
	Y				
	WW-c=WW-b	SW=WW-a	P=B	WB=C	
	62	55	48	47	
	K				
	SB=WW-b	U=G	B=WB=C		
	44	22	13		
SHL	H				
	WW-a=G	O=BE			
	58	37			
	S				
	WW-c=O=WW-a=SB=K	SW=G=P=U	B=C=PE		
	4	3	2		
combination	C+M+Y+K				
	B=WB				
	165				

Figure 8(a-b) The targets difined with different format of CMYK

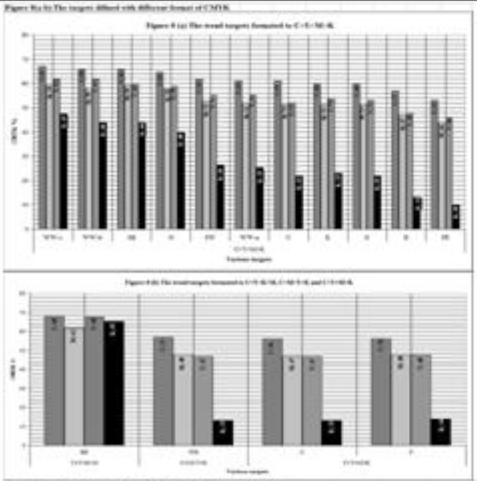

Figure 9: The targets identified with C, M, Y and K parameters

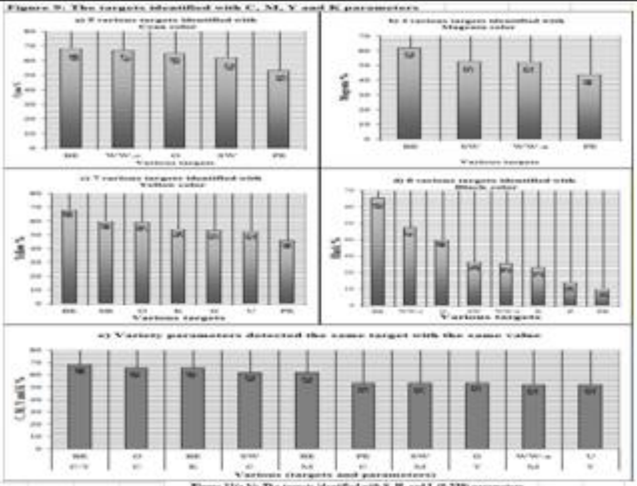

Figure 10: The targets defined with different format of SHL

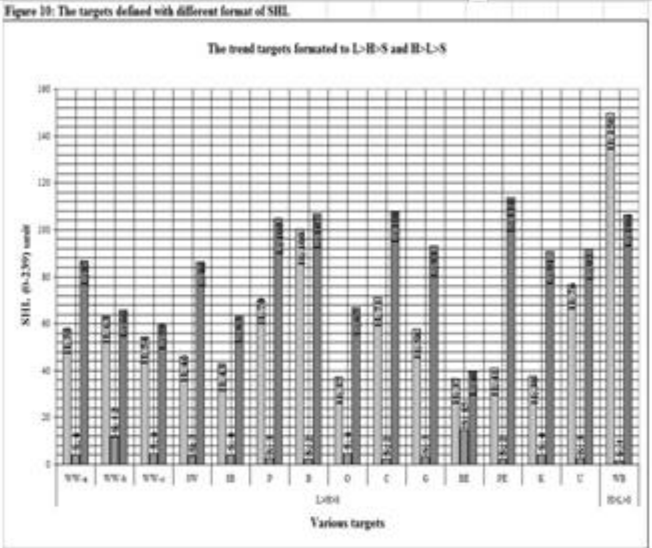

Figure 11(a-b): The targets identified with S, H, and L (0-239) parameters

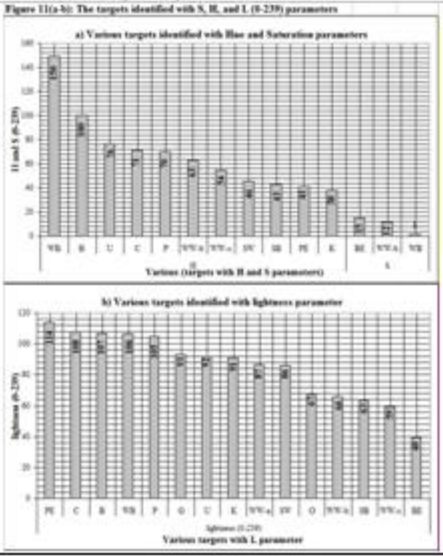

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Table 4: Summarized of Variety No.,Variety %,Highest and lowest (targets and values), Quadrat of values, Isotropic/Conjoined targets, Trend format, Variety parameters detected various targets with the same values and Variety parameters detected the same targets with the same values (target and value) with (RGB, CMYK% and HSL) parametrs and (RGB, CMYK and HSL) combinations

	R		G		B		R+G+B		C		M		Y		K		C+M+Y+K		H		S		L		H+S+L	
	PE	123	PE	123	PE	121	PE	367	BE	68	BE	62	BE	68	BE	65	BE	263	WB	150	BE	15	PE	114	WB	257
	C	116	C	116	B	115	C	347	WW-c	67	WW-c	59	WW-c	62	WW-c	47	WW-c	236	B	100	WW-b	12	C	108	B	209
	B	114	B		WB		B	344	SB	66	SB		WW-b		SB	44	WW-b	229	U	76	WW-c	4	B	107	C	181
	WB	113	WB	114	C		WB	342	WW-b		WW-b	58	SB	60	WW-b		SB	228	C	71	O		WB	106	P	178
	P		P	113	P	112	P	338	O	65	O		O	59	O	40	O	222	P	70	WW-a		P	105	U	171
	G	100	G	101	G	99	G	300	SW	62	SW	53	SW	55	SW	26	SW	196	WW-b	63	SB		G	93	PE	157
	K	99	U	100	U	98	U	296	WW-a	61	WW-a	52	WW-a		WW-a	25	WW-a	193	WW-a	58	K		U	92	G	154
	U	98	K	99	K	96	K	294	U		K	51	K	54	K	23	K	188	G		SW	3	K	91	WW-a	149
	WW-a	94	WW-a	95	WW-a	92	WW-a	280	G	60	U		G	53	U	22	U	186	WW-c	54	G		WW-a	87	ww-b	141
	SW	93	SW	94	SW	91	SW	278	K		G		U	52	G		G	185	SW	46	P		SW	86	SW	135
	O	73	O	73	O	71	O	217	WB	57	P	48	P	48	P	14	P	166	SB	43	U		O	67	K	132
	WW-b	70	WW-b	70	SB	67	WW-b	206	B		WB		B		B	13	B	165	PE	41	B	2	WW-b	66	WW-c	118
	SB	69	SB	69	WW-b	66	SB	205	P	56	C	47	WB	47	WB		WB		K	38	C		SB	63	SB	110
	WW-c	64	WW-c	65	WW-c	62	WW-c	191	C		B		C		C		C	163	O	37	PE		WW-c	59	O	109
	BE	45	BE	45	BE	40	BE	131	PE	53	PE	44	PE	46	PE	10	PE	153	BE		WB	1	BE	40	BE	91
Variety No.		14		14		13		15		10		9		11		11		14		13		6		15		15
Variety %		93		93		87		100		67		60		73		73		93		87		40		100		100
Highest & lowest targets		PE-BE							BE-PE										WB-BE		BE-WB		PE-BE		WB-BE	
Highest & lowest value		123-45				'121-40		'367-131		'68-53		'62-44		68-46		'65-10		'195-100		'150-37		'15-1		'114-40		'257-91
Quadrat of values		78				81		236		15		18		22		55		95		113		14		74		166

Parameter	R	G	B	C	M	Y	K	C+M+Y+K	H	S
Isotropic/Conjoined targets	WB=P	C=B	B=WB=C	SB=WW-b	WW-c=SB	WW-c=WW-b	SB=WW-b	B=WB	WW-a=G	WW-c=O=Ww-a=SB=K=SW=G=P=U=B=C=BE
				WW-a=U	WW-b=O	SW=WW-a	U=G		O=BE	
				G=K	K=U=G	P=B	B=WB=C			
				WB=B	P=WB	WB=C				
				P=C	C=B					

Trend format					
R=G>B	PE,C,P,K,O,WW-b,SB&BE	C>Y>M>K	WW-c,WW-b,SB,O,SW,WW-a,U,K,G,B&PE	L>H>S	WW-a,WW-b,WW-c,SW,SB,P,B,O,C,G,BE,PE,K&U
G>R>B	G,WW-a,SW & WW-c	C=Y>K>M	BE	H>L>S	WB
G>B>R	B	C>M>Y>K	WB		
B>G>R	WB	C>Y=M>K	C & P		
G>R=B	U				

Variety parameters detected various targets with the same values

Parameter	Target	Parameter	Target	Value
R	C	G	B	116
	B		WB	114
	G		U	100
	WW-a		SW	94
	G	B	K	99

Parameter	Target	Value	Parameter	Target	Value	Parameter	Target	Value
C	O	65	K	BE	65			
	SW	62	M		62			
	PE	53		SW	53	Y	G	53
				WW-a	52		U	52

Parameter	Target	Value
H	WW-b	63
L	SB	

Variety parameters detected the same targets with the same values

R=G	PE,C,P,K,O,WW-b,SB&BE	C=Y	BE
R=B	U		