A Survey on Detection of Inorganic Substances in Vegetables and Fruits

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ABSTRACT

The population of earth is increasing exponentially but the natural resources are limited. Food is among the three basic needs of humans. Farmers continuously try to increase the production of crops. Artificial fertilizers help in boosting the growth of the crops than the natural ones, therefore farmers try to maximize the produce by using them. These may lead to the increase in production but in turn degrade the quality of produce. Due to excessive use of fertilizers and pesticides these chemicals enter the food chain and ultimately cause bio magnifications causing an adverse effect on our health. Hence we need a portable device that can analyze the organic components of the fruit/vegetable. This research focuses on determining the organic as well as inorganic components of the fruit/vegetable so that the consumer may know whether the eatable is fit for consumption or not. There should be a device that would show the ratio of organic components to inorganic components. The consumer can use this ratio as a benchmark to buy the eatables fit for.

Keywords : Inorganic Substances, fertilizers, pesticides, Chlorophyll, Pesticides and Fertilisers, NDVI.

I. INTRODUCTION

India ranks second in the production of vegetables and fruits after China with 13.4% of total world's production. Among the total population of 1.25 billions, approximately 110.7 million comes under the category of farmers. Also, India ranked fourth in the world in the production of agrochemicals and fertilizers. Survey conducted by various institutes indicates that 45-75% of vegetable and fruit production are contaminated with pesticide residues. Also, pesticides on crops are use by farmers above the legal residue limit that is defined by WHO, The short answer is not quite yet. In spite of all the

methodologies, finding out the inorganic contents in day to day life isn't possible.

1.Chlorophyll: Cholorphyll is a green synthetic substance which is used for the performance of photosynthesis. It absorbs red light hence plants containing chlorophyll are green in color.

2. Pesticides and Fertilisers: Pesticides are used to kill insects which infect the plant. Fertilisers are mixed with the soil to boost the growth of the plant and keep it healthy.

3. NDVI: Normalized Difference Vegetation Index as shown below uses the NIR and red channels in its formula. Healthy plants (chlorophyll) reflect more near-infrared (NIR) and green light compared to other

wavelengths. But it absorbs more red and blue light. The value ranges between -1 and +1. A low reflectance (or low value) in the red channel and a high reflectance in the NIR channel, will yield a high NDVI value. And vice versa.

$$NDVI = \frac{(NIR - Red)}{(NIR + Red)}$$

II. LITERATURE SURVEY

Steven J. Lehotay, KaterinaMastovska, Aviv Amirav,Alexander B. Fialkov, Tal

Alon, Perry A. Martos, André de Kok and Amadeo R. Fernández-Alba., "Identification and confirmation of chemical residues in food by chromatography-mass spectrometry" [5]

Gas-liquid chromatography (GLC) is often used to determine monosaccharides—both qualitatively and quantitatively. To determine the monosaccharides

present in a food product, they are first extracted (with water) from the product.

Polyphenolic compounds of fruit may play an important role in physiologic functions related to human health. Different polyphenolics may have different biological activities including antioxidant activity. The objective of this study was to investigate the profiles of polyphenolic compounds in different apple varieties and different parts of an fruit. The total and individualn polyphenolics differed significantly among the eight apple cultivars grown in Ontario, and the peels had higher concentrations than the fleshes done by High performance liquid Chromatography.[2]

Leaf chlorophyll readings as an Indicator for spinach yield and nutritional fertilizers Applications.[9] The field scout 1000 device is a portable device which is a point and shoot gun which is hovered over the plants and the ndvi normalized difference vegetation index of the plants is displayed on the gun itself. This method is a non destructive one but due to its high cost, it is not feasible.

Sr. No.	Paper Name	Author Name	Advantages	Limitations
1.	Method for the determination of pesticides in food via gas chromatography with electron-capture detection.	Ronald E. Hunter, Anne M. Riederer	High Resolution Quick analysis Small sample needed	During injection of sample proper attention required Fixed gas analysis
2.	Analysis of Organic Acids in fruits and vegetables by liquid chromatography.	Pilar Flores, Pilar Hellin, Jose Fenoll	High accuracy High speed Good sensitivity	High Cost Complex Method
3.	Leaf chlorophyll readings as an Indicator for spinach yield and nutritional fertilizers Applications.	Andrew Smith, Yan-Ju Liu, Yi-Ping Tong, Yong-Guan Zhu, Hui Ding	Portable Easily available online	Costly(approximately 1,20,000rs per unit) Needs information about software

TAXONOMY CHART

Paper Name	Portable	Cost Effective	No Prior Knowledge	No Laboratory setup	No attention required
Method for the determination of pesticides in food via gas chromatography with electron-capture detection.	NO	NO	NO	YES	NO
Analysis of Organic Acids in fruits and vegetables by liquid chromatography.	NO	NO	NO	YES	YES
Leaf chlorophyll readings as an Indicator for spinach yield and nutritional fertilizers Applications.	YES	NO	NO	YES	YES

III.CONCLUSION

As we have seen in the introduction and literature survey some of the above mentioned methods are destructive, also the required equipments are not easily available in the market.Some of the methods don't have portable devices. The field scout 1000 device is a portable and non destructive one but due to the high end technology it's complex and not feasible.Therefore a method to check the inorganic contents should be deviced which is portable, feasible, non destructive i.e without taking any samples or cutting or damaging the eatables, which can be used by vendors and farmers. It will spread awareness among the masses and help them with their day to day eatables. So, we can check any eatable like in our houses, ports, shops, etc, without any fuss. It should give us values of the organic content instantly. So, no more waiting for the lab results. The current methods for checking quality of fruit/vegetable need a lot of time and proper lab equipment is required. It is cumbersome method and it is not possible to check each and every sample before eating.

IV. ACKNOWLEDGEMENT

V.   REFERENCES

[1].   Pavia, L., Gary M. Lampman, George S. Kritz, Randall G. Engel (2006). Introduction to Organic Laboratory Techniques (4th Ed.). Thomson Brooks/Cole. pp.797–817. ISBN.

[2].   Gerber, F.; Krummen, M.; Potgeter, H.; Roth, A.; Siffrin, C.; Spoendlin, C. (2004). "Practical aspects of fast reversed-phase high-performance liquid chromatography using 3μm particle packed columns and monolithic columns in

pharmaceutical development and production working under current good manufacturing practice". Journal of Chromatography A. 1036 (2): 127–133. doi:10.1016/j.chroma.2004.02.056. PMID15146913.

[3]. Carlson, T.N. and D.A. Ripley. 1997. On the relation between NDVI, fractional vegetation cover, and leaf area index. Remote Sensing of the Environment 62(3):241-252.

[4]. Huete, A., Justice, C., and W. van Leeuwen. 1999. MODIS vegetation index (MOD 13) algorithm theoretical basis document, version 3. USGS Land Process Distributed Active Archive Center. http://modis.gsfc.nasa.gov/data/atbd/atbd_mod13.pdf

[5]. Steven J. Lehotay, KaterinaMastovska, Aviv Amirav,Alexander B. Fialkov, Tal Alon, Perry A. Martos, Andre ́de Kok and Amadeo R. Ferna ́ndez-Alba., "Identification and confirmation of chemical residues in food by chromatography-mass spectrometry

[6]. Bhandari, A. K., A. Kumar, and G. K. Singh. 2012 FeatureNextraction using Normalized Difference Vegetation Index(NDVI): a case study of Jabalpur city.

[7]. Jensen, J. R. 1996. Introductory digital image processing. Prentice-Hall,Inc., Upper Saddle River, NJ.

[8]. Bueno, D., et al. "Characterization of biosensors for the detection of pesticides using a sequential injection analysis system." Sept. 2010 in Electrical Engineering Computing Science and Automatic a Control (CCE), pp.429-433,.

[9]. Leaf chlorophyll readings as an Indicator for spinach yield and nutritional fertilizers Applications.

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