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نهمین کنگره بین المللی

تـــوسعه کشاورزی و
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Review: Near Infrared (NIR) Spectroscopy as a Means of Improving Feed Production

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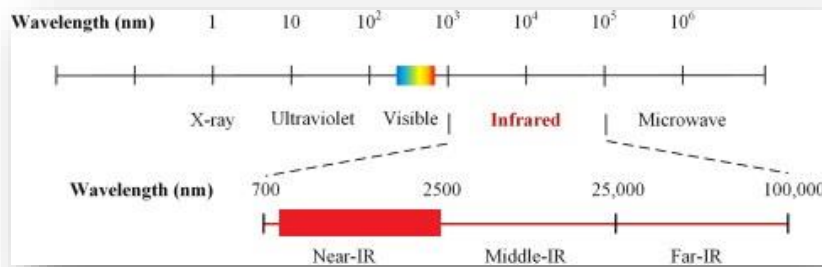 Babak_moghaddasi@yahoo.com

ABSTRACT

1. In recent years, science and technology are helpful to have better measurement or purity calibration on our specific activities. Over time lack of accuracy, Analyzing production data to identify opportunities for cost reduction and productivity improvement and off farm methods lead studies to improve methods that's more accessible on farm and more efficient than others technique. Based on the Near Infrared (NIR) spectroscope information we can have better management of feed products therefore it is going to effect on livestock products.

For reasons that we are going to discuss, we can claim that Near Infrared (NIR) spectroscopy is the most efficient method of this technique. NIR is useful to measure purity of material components such as feed ingredients.

Keywords: NIR, Feed, Livestock, Analysis, Seed

1.   INTRODUCTION

Feed is the largest production cost of livestock production and has a main factor on animal production and health. Determination of feed composition is a remarkable step to manage these costs (Rahman, Abdur, et al, 2015). On another view, livestock selected for high production, which is require an acceptable feed ingredient combination. This is considerably not only as the animal health but also there are economical viewpoints (Givens et al., 1997). Near Infrared (NIR) method is a fast analytical way of measuring for feed nutritional parameters such as protein, fiber, moisture, starch and more (Vincent and Pierre, 2021). Most other techniques are more expensive, take more time and need considerable sampling works while this method is real time (Rego, Guillermo et al, 2020). In this method, we can measure spectra for liquid, slurry and solid sample with no necessary pretreatment. Therefore, it can provide the results quickly. Usual chemical analysis of feed takes two to three days while NIR method provides results in two to three minutes (Corson, D. C, et al, 1999). NIR spectroscope works by using infrared waves. Specific thing about NIR is its wavelength, which is 780 to 2500 nanometers.

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Infrared radiation can be absorb by molecules in the sample. Radiation can turn into vibration of chemical bonds (Blanco and Villarroya, 2002). We can think of these chemical bonds as springs that hold two or more atoms together. There is a vibration in these springs naturally. When we add NIR energy to them, they will vibrate more and absorb some of the energy therefore, there is some energy absorbed and some reflected (Davies, 2005). Different type of chemical bonds such as O-H, C-H, N-H, S-H, C=O and more have different potency of NIR absorption and reflection, also there is a specific quantity of these bonds in each substance ingredients which is exclusive (Blanco and Villarroya, 2002). By knowing this information NIR spectroscope can measure the quantity of these bonds and related to their rate of each substance ingredients (Davies, 2005). NIR spectroscope control and form data under executive software and show the final result (Wajizah et al, 2020). NIR method could be widely used in many fields such as seed quality, nutrient availability and processing condition. In this object, there are four areas to discuss, rate of germination, amount of moisture, measurement of vigor, and grass seed purity. By using NIR method, we can estimate these details and expand quality and efficiency of grass seed in feed industry. Also we can use Near Infrared spectroscopy in discovering chemical toxins in feed sample to determine the feed health rate. (Ren, Wei-Bo, et al 2008).
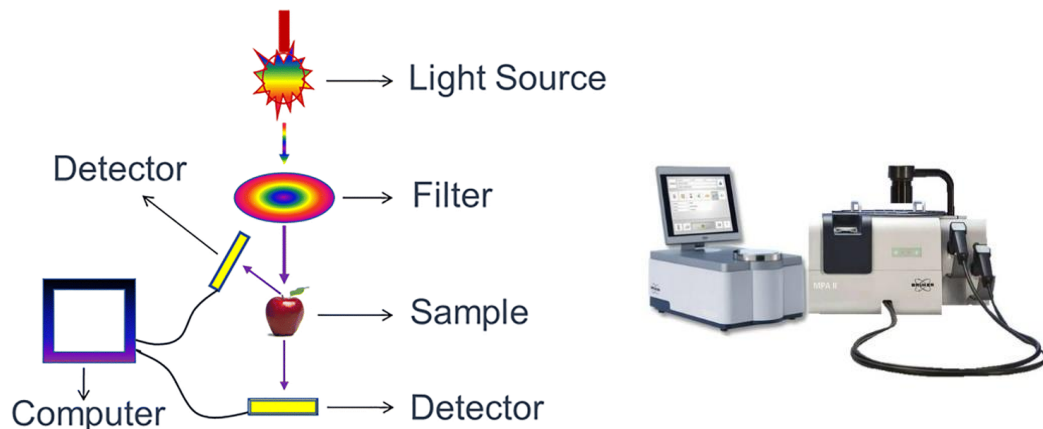
REFERENCES

Rahman, Abdur, et al. "Use and calibration of near infrared reflectance spectroscopy in feed analysis: a mini review." Pakistan Journal of Life and Social Sciences 13.1 (2015): 1-7.

Givens, D. I., J. L. De Boever, and E. R. Deaville. "The principles, practices and some future applications of near infrared spectroscopy for predicting the nutritive value of foods for animals and humans." *Nutrition research reviews* 10.1 (1997): 83-114.

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Vincent, Baeten, and Pierre Dardenne. "Application of NIR in Agriculture." Near-Infrared Spectroscopy: Theory, Spectral Analysis, Instrumentation, and Applications (2021): 331-345.

Rego, Guillermo, et al. "A portable IoT NIR spectroscopic system to analyze the quality of dairy farm forage." Computers and electronics in agriculture 175 (2020): 105578.

Corson, D. C., et al. "NIRS: Forage analysis and livestock feeding." Proceedings of the New Zealand Grassland Association. 1999.

Blanco, M., and I. N. I. R. Villarroya. "NIR spectroscopy: a rapid-response analytical tool." TrAC Trends in Analytical Chemistry 21.4 (2002): 240-250.

Davies, A. M. C. "An introduction to near infrared spectroscopy." NIR news 16.7 (2005): 9-11.

Wajizah, Sitti, and Agus Arip Munawar. "Near infrared spectroscopy (NIRS) data analysis for a rapid and simultaneous prediction of feed nutritive parameters." Data in brief 29 (2020): 105211.

Ren, Wei-Bo, et al. "The application of near-infrared reflectance spectroscopy in seeds quality certification." Guang pu xue yu Guang pu fen xi= Guang pu 28.3 (2008): 555-558.