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# COMPARING DIGITAL IMAGE ANALYSIS AND VISUAL RATING OF GAMMA RAY INDUCED PERENNIAL RYE GRASS (*Lolium perenne*) MUTANTS

**Ajai Kumar Tiwari*, Gunjeet Kumar, Ganesh B. Kadam and Tarak Nath Saha**

*Directorate of Floricultural Research, College of Agriculture Campus Shivaji Nagar Pune -410 005*
**E-mail: drajaitiwari@gmail.com*

**ABSTRACT** : To generate variability in perennial rye grass and to select genotypes responsive to low management, gamma-ray irradiation was used for induction of dwarfness and other quality attributes. The main objective of this study was to identify changes and correlations among turf visual rating and digital image analysis in evaluating turf grass quality under different treatments. Differences were significant among irradiated population with respect to hue angle, brightness and saturation. The correlations of hue and DGCI were significantly positive with all the parameters of visual rating. There were non-significant correlation of brightness with quality and texture, and saturation and texture. The DGCI values were in tune with each of these parameters when the slope of regression line was significantly different from zero ($p<0.05$). These relationships were better in DGCI and hue ($r^2$ = 0.3531) DGCI and saturation ($r^2$ = 0.3017); DGCI and brightness ($r^2$ = 0.1196) and DGCI and colour ($r^2$ = 0.1725). Non-linear relationship was noticed between DGCI and quality ($r^2$ = 0.0004).

***Keywords :*** *Lolium perenne, turf quality, digital image analysis, dark green colour index.*

Traditional methods of determining turf quality have often been based on a visual rating system as per the National Turf grass Evaluation Program (NTEP) with a scale ranging from 1 to 9, with 1 representing the lowest quality and 9 representing the highest quality turf. A rating minimum of 5 is minimally acceptable (Morris, 10).This scale is mainly a function of colour, density, and uniformity (Horst *et al.,* 5). Differences in assessments by humans occur because of differences in individuals capability to perceive wave lengths of visible light, which lead to differences in visual estimates (Mirik *et al.*,9).Therefore, this rating system is biased due to subjectivities of the rater (Keskin *et. al.*,8).However, visual assessments are fast and easy to perform (Stafford and Goodenough, 4).

Spectral reflectance analysis (digital image analysis) has been introduced as an alternative to visual ratings for assessment of turf quality as a quick, reliable, and non-destructive methods (Da Costa *et al.,* 1).

Digital image analysis (DIA) provides an alternative method to measure the reflectance from vegetated surfaces. Karcher and Richardson (7) found that DIA showed strong agreement with visual ratings in evaluating turf colour. An index known as the dark green color index (DGCI) was developed by Karcher and Richardson (7) by using hue, saturation, and brightness (HSB) levels. DIA provides an objective, unbiased, non destructive and consistent measurements. This technique provides rapid, accurate, and precise results as recent digital image collection equipment and image analysis software have the capability to acquire and process hundreds of images per hour and images can be stored for further analysis at the researcher's convenience (Díaz-Lago *et al.,* 2). Digital imagery process is also a cost-effective technique as it requires only a digital camera, computer, and an image analysis program. A low-cost digital camera, with white balance adjusting, is sufficient for collecting images with low-quality Joint Photographers Expert Group (JPEG) compression format. Steddom *et al.* (13) concluded that results from digital image analyses, using low-quality (JPEG) images, have a number of desirable qualities for data quantification and have the same results of those of a loss less format such as TIFF or RAW images. Therefore, digital photography and subsequent image analysis maybe capable of quantifying turf grass color in field experiments. The objective of this study was to rapidly generate variability through mutagenesis and quantifying the differences in quality of irradiated Lolium perenne population by use of digital camera image analysis and supported by the software using an HSB colour scale.

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## MATERIALS AND METHODS

### Physical Mutagen Treatment

Irradiation with gamma rays of *Lolium perenne* with $Co^{60}$ was done on 30 uniform stolen (sprigs) sets of propagules for each treatment. These were