The use of white fibres in bread is a way to increase the intake of this component of the diet by the population preserving bread appearance and flavour characteristics. The objective of this study was to assess the variation in quality parameters of white pan bread after the addition of white wheat fibre - WF (0 to 10%), white oat fibre - OF (0 to 10%) and acacia gum - AG (0 to 5%), following a Central Composite Rotational Design. Eighteen fibre-enriched bread formulations were prepared and compared to a fibre-free control formulation. The breads produced were evaluated with respect to: specific volume, colour (L*, a*, b*), total colour difference (dE), crumb moisture, water activity (a_w) and firmness. Specific volume was assessed 24 h after processing and all other analyses on days 1, 4, 7 and 10 after bread production. WF, OF and AG decreased specific volume and increased L*, a* and b* parameters. WF and OF increased moisture, a_w and firmness. dE ranged from 1.71 to 6.62. Three formulations were produced for validation of the predictive models obtained from the Response Surface Methodology: FF (2.5% AG), FR1 (6% OF and 2.5% AG) and FR2 (2% WF, 4% OF and 2.5% AG). Moisture, a_w, L* and b* values showed a high correlation between predicted and experimental results. FR2 with 6.70% total fibre and 2.39% soluble fibre can be classified as “high fibre” and is a good option for the enrichment of bread with white fibres.