A novel concept of using Nutraceutical Industrial Coriander Seed Spent (NICSS) and Congo red (CR) dye adsorbed onto NICSS (CR-NICSS) as filler materials to fabricate polypropylene (PP) green thermoplastic composites and unsaturated polyester resin unsaturated polyester resin (USP)/CR-NICSS and USP/NICSS composites is presented. To maximize the adsorption of CR on NICSS and to study the influence of five parameters viz, process time, temperature, initial concentration of dye, adsorbent dosage and pH of the reaction mixture, we use a two-level fractional factorial design approach and analysis of variance to develop statistical model. The composites were evaluated for physico-mechanical and tribological properties and compared with the thermoplastic composites fabricated using NICSS. Flexural strength and flexural modulus of composites were improved by adding CR-NICSS and NICSS into PP matrix. The abrasive wear behavior, wear volume loss and specific wear rate as a function of abrading distance at 150, 300, 450, and 600 m and different loads of 23.54 and 33.54 N at 200 rpm were determined. The water absorption characteristics of thermoplastic composites were studied. The surface morphology of tensile fractured PP/CR-NICSS was examined under scanning electron microscope. The influence of water and thermal ageing on tensile strength and physical properties, such as density, surface hardness and effect of chemicals on USP/CR-NICSS and USP/NICSS are reported. POLYM. COMPOS., 2018. © 2018 Society of Plastics Engineers