GENERALIZED QUASI YAMABE GRADIENT SOLITONS

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Abstract: A complete Riemannian manifold \((M^n, g)\), \(n \geq 3\), is a generalized quasi-Einstein manifold, if there exist three smooth functions \(f\), \(\mu\) and \(\beta\) on \(M\) such that

\[
Ric + \nabla^2 f - \mu df \otimes df = \beta g,
\]

A complete Riemannian manifold \((M^n, g)\), \(n \geq 3\), is a generalized quasi Yamabe gradient soliton (GQY manifold), if there exist a constant \(\lambda\) and two smooth functions \(f\), \(\mu\) on \(M\) such that

\[
(R - \lambda)g = \nabla^2 f - \mu df \otimes df
\]

In this paper, from the relationship between Weyl tensor \((W)\) and the covariant tensor \((D)\), we proof that a nontrivial complete and connected generalized quasi Yamabe gradient soliton must be always a quasi Yamabe gradient soliton (\(\mu\) constant) and admits a warped product structure. Moreover, a nontrivial complete and connected locally conformally flat generalized quasi Yamabe gradient soliton has a more special warped product structure the type;

\[
(\mathbb{R}, dr^2) \times |\nabla u| (N^{n-1}, g_N)
\]

where \(N\) is a space form.

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