



**Ahmedabad
University**

WORKING PAPER

WP-SAS-21-005

Proteotoxicity caused by perturbed protein complexes leads to hybrid incompatibility

Krishna B S Swamy

krishna.swamy@ahduni.edu.in

Disclaimer: The Research Working Paper Series is managed by the Ahmedabad University Research Board (URB) to help faculty members, research staff and doctoral students to share their pre-publication versions of academic articles, book chapters, or reviews etc. Papers posted on this site are under progress, under submission, or in press and forthcoming elsewhere. The form and content of papers are the responsibility of individual authors and not that of Ahmedabad University.

Ahmedabad University, Commerce Six Roads, Navrangpura, Ahmedabad-380009, Gujarat, INDIA
Email: workingpaper@ahduni.edu.in



**Ahmedabad
University**

WORKING PAPER

Serial: WP-SAS-21-005

Title: Proteotoxicity caused by perturbed protein complexes leads to hybrid incompatibility

Author(s): Krishna B. S. Swamy, Hsin-Yi Lee, Carmina Ladra, Jung-Chi Chao, Yi-Yun Chen and Jun-Yi Leu*

School/Address:

School of Arts and Sciences
Ahmedabad University
GICT Building, Central Campus
Navrangpura, Ahmedabad 380009
Gujarat, India

Email: krishna.swamy@ahduni.edu.in

Abstract (150 words, Font 12):

Dobzhansky-Muller incompatibilities represent a major driver of reproductive isolation between species. They are caused when two or more interacting components encoded by alleles from different species cannot function properly when mixed. At incipient stages of speciation, complex incompatibilities involving multiple genetic loci with weak effects are frequently observed, but the underlying mechanisms remain elusive. We observed perturbed proteostasis leading to compromised mitosis and meiosis in *Saccharomyces cerevisiae* hybrid lines carrying one or two chromosomes from *Saccharomyces bayanus*. Levels of proteotoxicity are correlated with the number of protein complexes on replaced chromosomes and can be alleviated or aggravated, respectively, by up- or down-regulating the ubiquitin-proteasomal degradation machinery. Using proteomic approaches, we detect destabilized multi-protein complexes in a hybrid line. However, hybrid fitness can be significantly improved by rescuing small ribosomal subunits, a primary destabilized complex. Our findings reveal the general role of impaired protein complex assembly in complex incompatibilities.

Purpose: Peer-review publication

Design/Methodology/ Approach: Molecular and Cell biology, Transcriptomics and Proteomics

Findings: Unbalanced proteostasis leads to hybrid incompatibility, a novel molecular mechanism for speciation at the incipient stage.

Research Limitations/ implications:

Originality/ Value: It can provide insight into how new lineages are formed from hybrids. This is the first study discovering how new lineages begin to develop from introgressed hybrids.

Keywords: speciation, genetic incompatibility, proteostasis, protein complex, proteotoxicity, epistasis.

Description: