

ABSTRACT

Agroforestry systems (AFS) with fast-growing woody crops such as poplar (*Populus deltoides*) are increasingly integrated into agricultural land because it is considered as a sustainable agricultural practice that combines primary production with other ecosystem services (ES). To optimize the efficiency of AFS, the suggestion is to develop well modified tree-crop integration by limiting competition for resources and capitalize on the coactions. However, yield data of various wheat varieties in AFS are inadequate, in particular for *Populus deltoides* windbreak at a age of four and five year old plantation. Here we focused on winter wheat varieties (WH-1105, HD-2967 and HD-943) during two consecutive years (2017-2019) comprising delimited by a row of deciduous poplar trees in East-West and North-South directions (East-West tree line divide farmlands into two aspects i.e. Northern and Southern and North-South tree line divide into Eastern and western aspect). While effects on crop produce were limited for all wheat varieties with the increasing distance from tree line, however, five years old poplar planted on field bunds exhibited significant reduction up to 3 m in grain yield of wheat from tree line for all the wheat varieties. The highest available soil N (210.5 kg ha⁻¹), P (15.3 kg ha⁻¹) and K (280.2 kg ha⁻¹) were recorded near tree line at a distance of 3 m. To optimize the provisioning service of poplar windbreak AFS, the cultivation of highly shade tolerant wheat variety HD-2967 may be advisable over other wheat varieties towards the end of the rotation of poplar windbreak AFS.

Introduction

Windbreaks under agroforestry systems (AFS) are considered to be a sustainable agricultural practice, as they bring an ample range of environmental services (ES) while upholding prime agricultural production. To optimize the efficiency of AFS, the suggestion is to develop well modified tree-crop integration by limiting competition for resources and capitalize on the coactions

Objective

- To evaluate the performance of early sown wheat varieties under east-west and north-south windbreaks of poplar
- To determine soil properties such as SOC and available N, P and K under under east-west and north-south windbreaks of poplar

Results

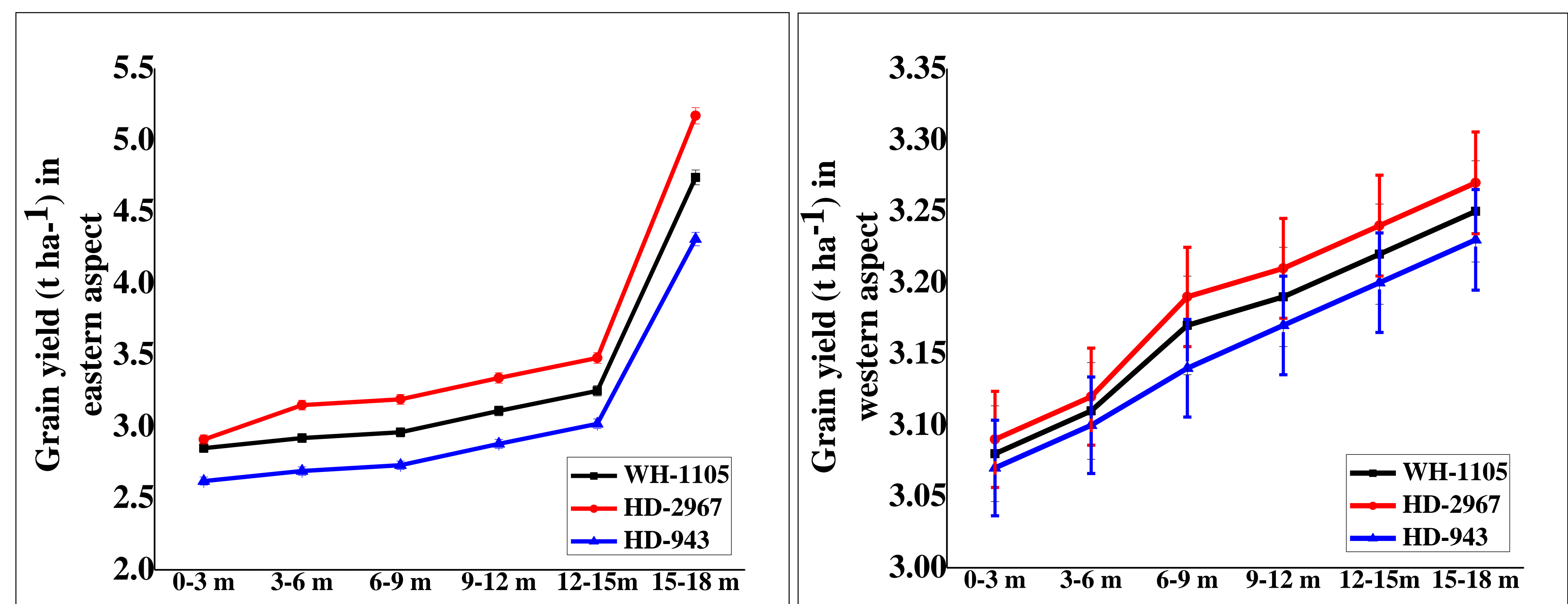


Fig 2. Effect of North-South bund plantation and different distances from the tree line of poplar on grain yield (t/ha) in wheat varieties (pooled data) of 2017-18 and 2018-19

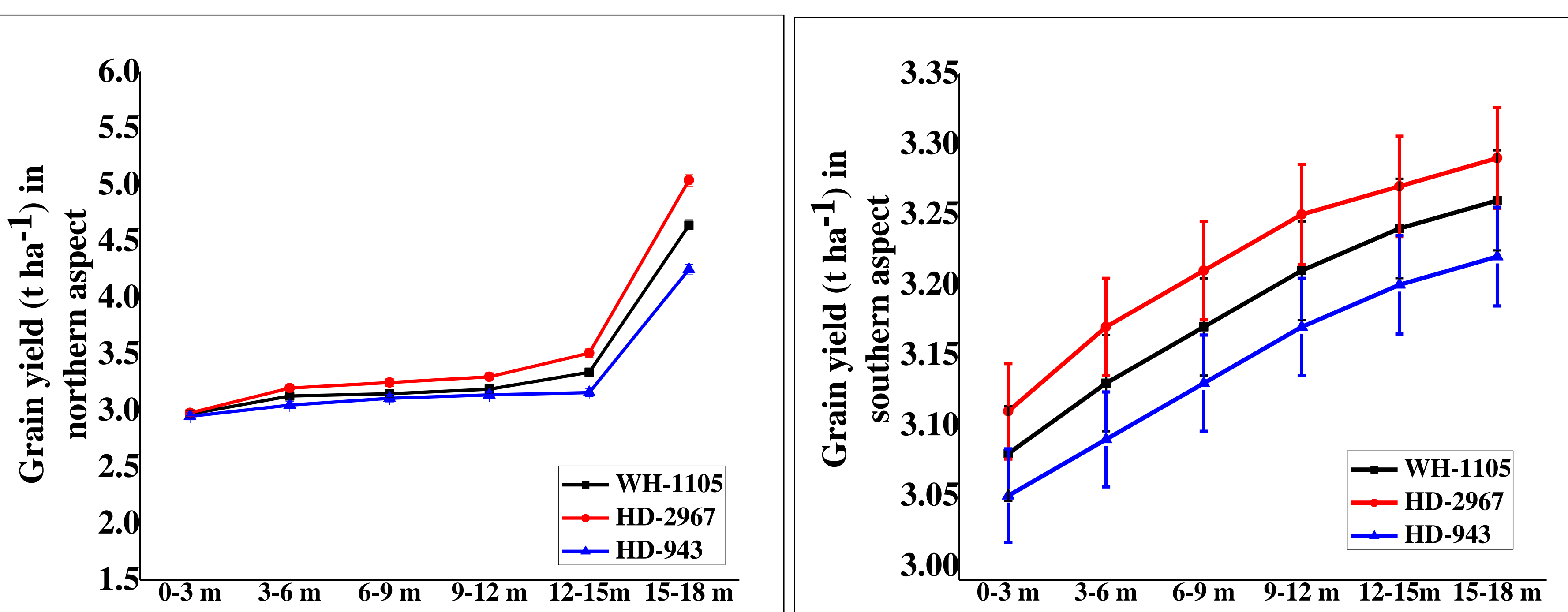


Fig 1. Effect of East-West bund plantation and different distances from the tree line of poplar on grain yield (t/ha) in wheat varieties (pooled data) of 2017-18 and 2018-19

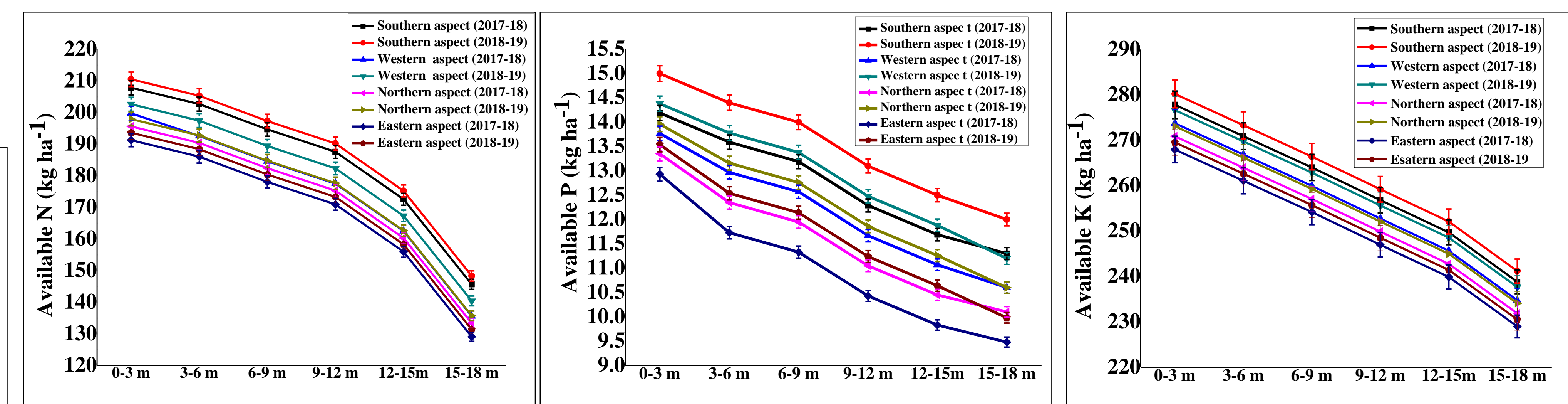


Fig 3. Effect of East-West and North-South bund plantation and different distances from the tree line of poplar on available N, P and K (kg ha⁻¹)

Conclusion

Considerable yield reductions were found near tree line at a distance of 0-3 m, for all the wheat varieties due to poor grain formation and competition for essential resources. To optimize the provisioning service of poplar windbreak AFS, the cultivation of highly shade tolerant wheat variety HD-2967 may be advisable over other wheat varieties towards the end of the rotation of poplar windbreak AFS.